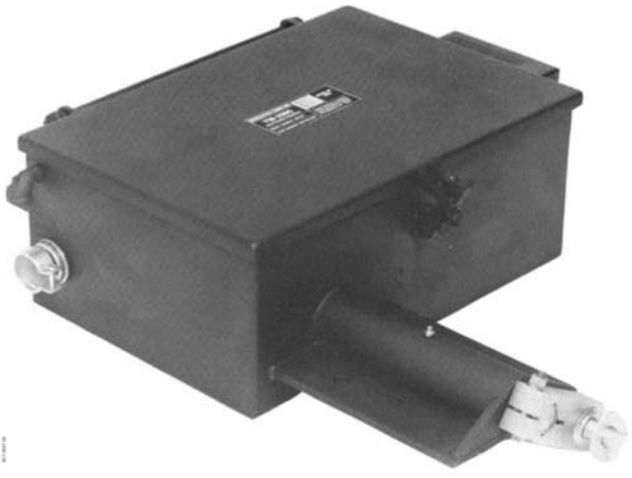
YM-2000
Electric Switch Machine

ASTS USA Part No.
N451063-0301 (Right Hand)
N451063-0303 (Right Hand
N451063-0502 (Left Hand)



- Installation
- Operation
- Maintenance

Copyright© 2010
Ansaldo STS USA, Inc.

Proprietary Notice

This document and its contents are the property of Ansaldo STS USA, Inc. (formerly known as Union Switch & Signal Inc., and hereinafter referred to as "ASTS USA"). This document is furnished to you on the following conditions: 1.) That no proprietary or intellectual property right or interest of ASTS USA is given or waived in supplying this document and its contents to you; and, 2.) That this document and its contents are not to be used or treated in any manner inconsistent with the rights of ASTS USA, or to its detriment, and are not to be copied, reproduced, disclosed or transferred to others, or improperly disposed of without the prior written consent of ASTS USA.

Important Notice

ASTS USA constantly strives to improve our products and keep our customers apprised of changes in technology. Following the recommendations contained in the attached service manual will provide our customers with optimum operational reliability. The data contained herein purports solely to describe the product, and does not create any warranties.

Within the scope of the attached manual, it is impossible to take into account every eventuality that may arise with technical equipment in service. Please consult an ASTS USA local sales representative in the event of any irregularities with our product.

ASTS USA expressly disclaims liability resulting from any improper handling or use of our equipment, even if these instructions contain no specific indication in this respect. We strongly recommend that only approved ASTS USA spare parts are used as replacements.

Revision History

Rev.	Date	Nature of Revision
Original	November 1991	Original Issue
Revision*	November 1993	-
Revision*	January 1999	
Revision*	October 1999	
4	April 2002	
5	November 2003	Incorporated ECO 139712-95. Added Figures 2-6 through 2-11 to show wiring diagrams for 115VAC – 115VAC control configuration for left hand and right hand switch machines. Incorporated ECO 139805-4. Added the new left hand version of the switch machine into the manual. Incorporated ECO 139712-201. Clarified the adjustment procedure for the motor cutout micro-switch for hand crank operation. Various editorial and format changes.
6	July 2008	Replaced Figs. 2-6, 7, and 8 with improved image quality versions.
7	August 2010	Incorporated ECO 140321-4 for a new brake release shaft design that incorporates and auxiliary release extension. Added Figure 3-3. Added wiring diagrams for new motor. Figure 3-5 revised.

* Revision was not numbered – only dated

Table of Contents

1. GENERAL INFORMATION 1-1
1.1. Safety Summary 1-1
1.2. Abbreviations and Acronyms 1-1
1.3. Unit Symbols 1-1
2. INTRODUCTION 2-1
2.1. Scope of Manual 2-1
2.2. Description 2-1
2.3. Switch Layout Options 2-2
2.3.1. U-5 Switch Circuit Controller 2-2
2.3.2. ES-20 Color Signal or H-2 Searchlight Dwarf Signal 2-2
2.3.3. Local Operation 2-3
2.4. Specifications 2-3
2.4.1. General 2-3
2.4.2. Contactors 2-6
2.4.3. Assemblies and Functions 2-7
2.4.4. Electrical Control Components 2-10
3. EQUIPMENT INSTALLATION 3-1
3.1. General 3-1
3.2. Mounting 3-1
3.3. Gear Motor 3-2
3.4. Wiring 3-2
3.5. Switch-Operating Rod 3-5
3.6. Switch Heater 3-6
3.7. Wiring Diagrams 3-6
4. OPERATION 4-1
4.1. Remote Operation 4-1
4.2. Trailing Operation 4-4
4.3. Control and Indication Switches and Cams 4-4
4.4. Motor Limit and Holding Circuit Switches and Cams 4-5
4.4.1. Right-Hand Machine Motor Limit Switches and Cams 4-5
4.4.2. Right-Hand Machine Holding Circuit Switches and Cams 4-6
4.4.3. Left-Hand Machine Motor Limit Switches and Cams 4-8
4.4.4. Left-Hand Machine Holding Circuit Switches and Cams 4-10
4.5. Hand Crank Operation 4-13
4.6. Motor Protection 4-19
4.6.1. Current Overload 4-19
4.6.2. Thermal Overload 4-21
5. MAINTENANCE AND TEST PROCEDURES 5-1
5.1. Preventive Maintenance Schedule 5-1
5.2. Preventative Maintenance Activities 5-1
5.2.1. Cleaning 5-2

5.2.2. Inspection 5-2
5.3. Lubrication 5-4
5.3.1. Gear Motor 5-4
5.3.2. Oiling Other Components 5-4
5.4. Adjustments 5-4
5.4.1. Motor Limit Switch Cam Adjustment 5-4
5.4.2. Holding Circuit Cam Adjustment 5-6
5.4.3. Clutch Adjustments 5-7
5.4.4. Brake Lining Wear Adjustment 5-11
5.4.5. Friction Disc Replacement 5-12
5.4.6. Solenoid and Associated Component Replacement 5-12
5.4.7. Brake Troubleshooting 5-13
5.4.8. Solenoid Troubleshooting 5-14
5.4.9. Motor Cutout Micro-Switch Adjustment Procedure 5-15
5.5. Gear Motor Maintenance 5-18
5.5.1. Removal 5-18
5.5.2. Installation 5-19
6. SWITCH MACHINE PARTS LIST 6-1
7. RAIL TEAM AND TECHNICAL SUPPORT 7-1

List of Figures

Figure 2-1. YM-2000™ Electric Switch Machine 2-2
Figure 2-2. YM-2000™ Dimensions (Right Hand) 2-4
Figure 2-3. YM-2000™ Dimensions (Left Hand) 2-5
Figure 2-4, YM-2000™ Assemblies (Right Hand) 2-8
Figure 2-5. YM-2000™ Assemblies (Left Hand) 2-9
Figure 2-6. YM-2000™ Electrical Control Components (Right Hand) 2-11
Figure 2-7. YM-2000™ Electrical Control Components (Left Hand) 2-12
Figure 3-1. YM-2000™ Sample Layout (Right and Left Hand Switches) 3-3
Figure 3-2. YM-2000™ Sample Layout Using Mounting Plate 3-4
Figure 3-3. YM-2000™ Right Hand Machine With Left Hand Layout 3-5
Figure 3-4. Typical Wiring Diagram With Switch Heater For Switch Machines Manufactured Before July 2010 3-7
Figure 3-5. Typical Wiring Diagram With Switch Heater For Switch Machines Manufactured After July 2010 3-9
Figure 3-6. Typical Wiring Diagram For Switch Machine Manufactured Before July 2010 3-11
Figure 3-7. Typical Wiring Diagram For Switch Machines Manufactured After July 2010 3-13
Figure 4-1. YM-2000 Key Component Orientation 4-2
Figure 4-2. YM-2000 Machine and Layout Orientation 4-3
Figure 4-3. YM-2000 Microswitch Contact Configuration & Operating Sequence 4-3
Figure 4-4. Control and Indication Switches 4-5
Figure 4-5. Motor Limit Switches (SR Activated) 4-5
Figure 4-6. Motor Limit Switches (Mid-Stroke Position) 4-6
Figure 4-7. Motor Limit Switches (SL Actuated) 4-7
Figure 4-8. Holding Circuit Switches (S1 Actuated) 4-7
Figure 4-9. Holding Circuit Switches (Mid-Stroke Position) 4-8
Figure 4-10. Holding Circuit Switches (S2 Actuated) 4-9
Figure 4-11. Motor Limit Switches (SL Activated) 4-9
Figure 4-12. Motor Limit Switches (Mid-Stroke Position) 4-10
Figure 4-13. Motor Limit Switches (SR Actuated) 4-11
Figure 4-14. Holding Circuit Switches (S1 Actuated) 4-11
Figure 4-15. Holding Circuit Switches (Mid-Stroke Position) 4-12
Figure 4-16. Holding Circuit Switches (Mid-Stroke Position) 4-12
Figure 4-17. Hand Crank Components (Right Hand Switch) 4-14

Figure 4-18. Hand Crank Components (Left Hand Switch) 4-15
Figure 4–19. Brake Release Stud Storage in Hand Crank 4-16
Figure 4–20. Using the Brake Release Stud with the Hand Crank 4-16
Figure 4–21. Releasing/Applying the Motor Brake and Hand-Crank Operation 4-18
Figure 4-22. Location of Current Overload Module 4-20
Figure 4-23. Manual Reset Button and Mode Selector on the Current Overload Module 4-21
Figure 5-1. Air gap 5-11
Figure 5-2. Solenoid Components 5-13
Figure 5-3. Hand Crank Access Cover in Closed Position (View from Outside the Switch Machine). 5-16
Figure 5-4. Hand Crank Access Cover In Open Position (View from Outside the Switch Machine) 5-17
Figure 5-5. Free Play Between Roller and Pivot Cam (Viewed from Outside the Switch Machine) 5-18
Figure 6-1. YM-2000™ Parts Locations for R.H. Switch Machine (Sheet 1 of 2) 6-6
Figure 6-2. YM-2000™ Parts Locations for R.H. Switch Machine (Sheet 2 of 2) 6-7
Figure 6-3. YM-2000™ Parts Locations for L.H Switch Machine (Sheet 1 of 2) 6-8
Figure 6-4. YM-2000™ Parts Locations for L.H Switch Machine (Sheet 2 of 2) 6-9

List of Tables

Table 2-1. General Specifications for the YM-2000™ Switch Machine 2-3
Table 2-2. Contactor Specifications for the YM-2000™ Switch Machines 2-6
Table 2-3. YM-2000™ Assemblies and Functions 2-7
Table 2-4. YM-2000™ Electrical Control Components 2-10
Table 5-1. Preventive Maintenance Schedule 5-1
Table 6–1. Basic Switch Machine Configuration 6-1

1. GENERAL INFORMATION

1.1. Safety Summary

Read and thoroughly understand this manual before attempting any of the procedures listed. Pay particular attention to:

CAUTION

and

WARNING

These headings may appear throughout this manual. Caution statements indicate conditions that could cause damage to equipment. Warning statements indicate conditions that could cause physical harm, serious injury, or loss of life. Always observe standard precautions familiar to trained electrical technicians. Always adhere to all safety regulations stipulated by the railroad.

1.2. Abbreviations and Acronyms

ac alternating current

dc direct current

ASTS USA Ansaldo STS USA, Inc. (formerly known as Union Switch & Signal Inc.)

1.3. Unit Symbols

A Ampere

cm centimeter

Hz Hertz

in. inch

kg kilogram

lb pound

oz ounce

V Volt

Ω ohm

2. INTRODUCTION

2.1. Scope of Manual

This manual contains the installation, operation, and maintenance procedures for the YM-2000™ Switch Machine (Figure 2-1) with the following ASTS USA Part Numbers:

N451063-0301 115V ac - 115V ac Control
N451063-0303 115V ac - 24V dc Control
N451063-0502 115V ac – 115V ac Control

The information contained in this manual applies equally to the right- and left-hand versions of the YM-2000™ Switch Machine unless otherwise noted. Where there is a difference between the right- and left-hand versions of the switch machine it will be clearly indicated.

2.2. Description

The YM-2000™ is a trailable electric switch machine designed for use in railroad or transit yards, industrial sidings, and flat switching or storage yards.

Switch action is provided by a 115V ac gear motor, which is instantly reversible. An electromechanical brake is mounted on the motor armature shaft to prevent the motor from turning when it is not energized. The gear motor drives the switch-operating rod via a friction clutch and crank. This clutch is designed to slip if the switch points are forced by a trailing move of a locomotive or car wheel. Because the clutch slips, no resulting movement is transferred to the machine's internal mechanism, thus reducing machine wear and potential mechanical damage during a trailing move. Since the clutch is directly associated with the switch position, cams mounted on the external housing of the clutch are used to actuate motor control and indication switches. These cams and switches can be arranged to activate the gear motor and complete the switch throw following a trailing move. In this case, the gear motor drives the switch mechanism to the full-stroke position in the direction it was forced during the trailing move.

The YM-2000™ Switch Machine also features dual control operation, i.e., in addition to remote operation, the switch machine can be manually operated by inserting a hand crank at the end of the drive motor. Remote control of the YM-2000™ is automatically interrupted when the hand crank is inserted. A third control option is local operation of the switch machine via a pushbutton control panel (refer to Section 2.3.3).

The gear motor and control components of the YM-2000™ Switch Machine are arranged in a welded case designed to be positioned between two ties. The case has mounting lugs at both the front and rear to secure it to the ties. This mounting arrangement provides a low profile for clearance and permits the machine to be mounted close to the track.

(a) Right-Hand Switch Machine

(b) Left-Hand Switch Machine

Figure 2-1. YM-2000™ Electric Switch Machine

2.3. Switch Layout Options

2.3.1. U-5 Switch Circuit Controller

A U-5 Switch Circuit Controller option can be added to a switch layout to provide point detection. The U-5 is connected to the point with a connecting rod independent of the switch-operating rod. For more information, refer to Service Manual 4516.

2.3.2. ES-20 Color Signal or H-2 Searchlight Dwarf Signal

An ES-20 Color Light Electric Switch Signal or H-2 Searchlight Dwarf Signal option can be added to the switch layout to indicate the position of the YM-2000™ Switch Machine. For more information, refer to Service Manual 6334 or Service Manual 5034, respectively.

2.3.3. Local Operation

In addition to the standard remote operation and manual operation of the YM-2000™ Switch Machine, a local operation option can be added. This option allows the switch machine to be operated by means of two pushbuttons mounted in a box near the machine.

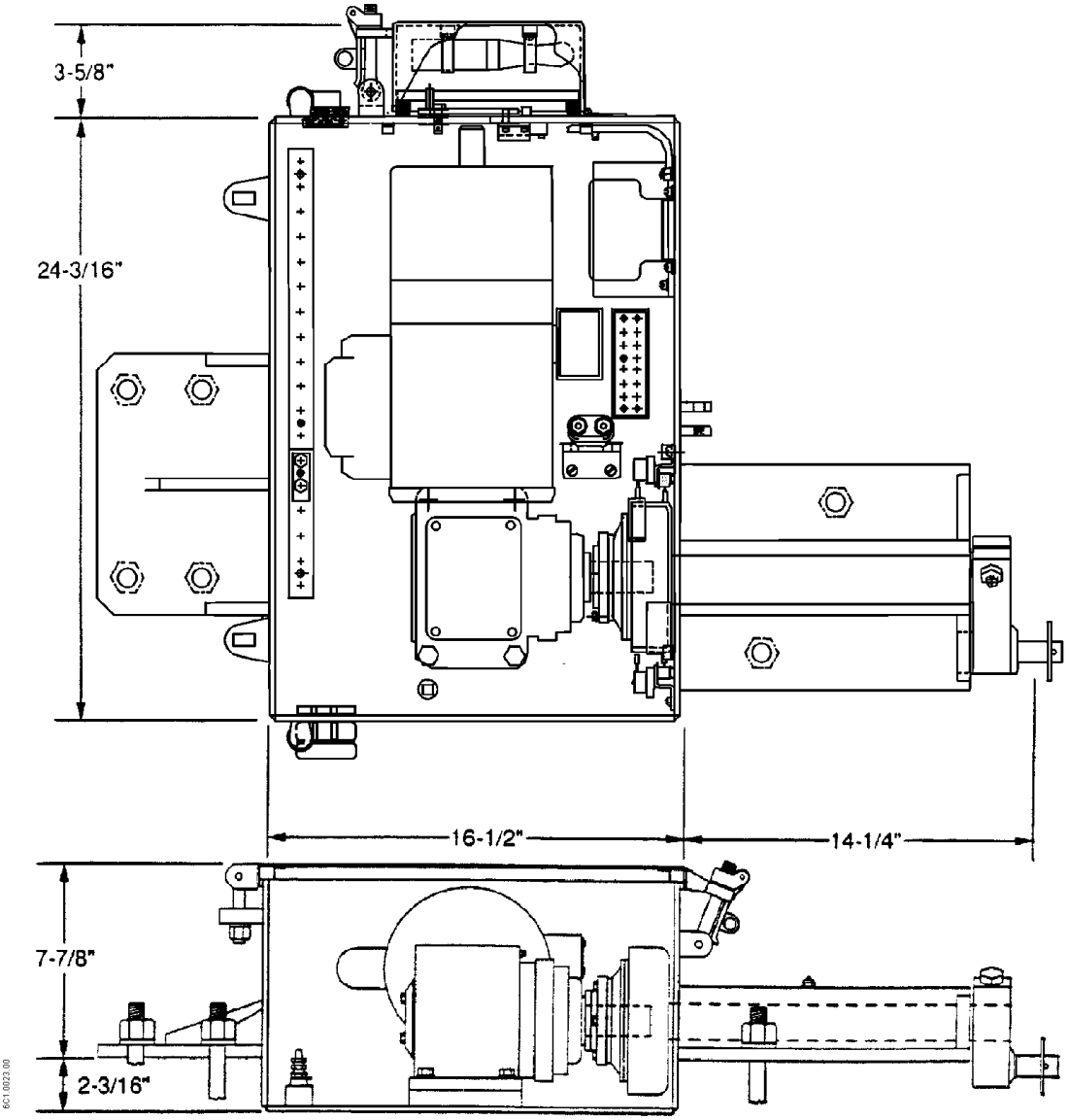
2.4. Specifications

2.4.1. General

The general specifications for the right and left hand YM-2000™ switch machines are presented in Table 2-1.

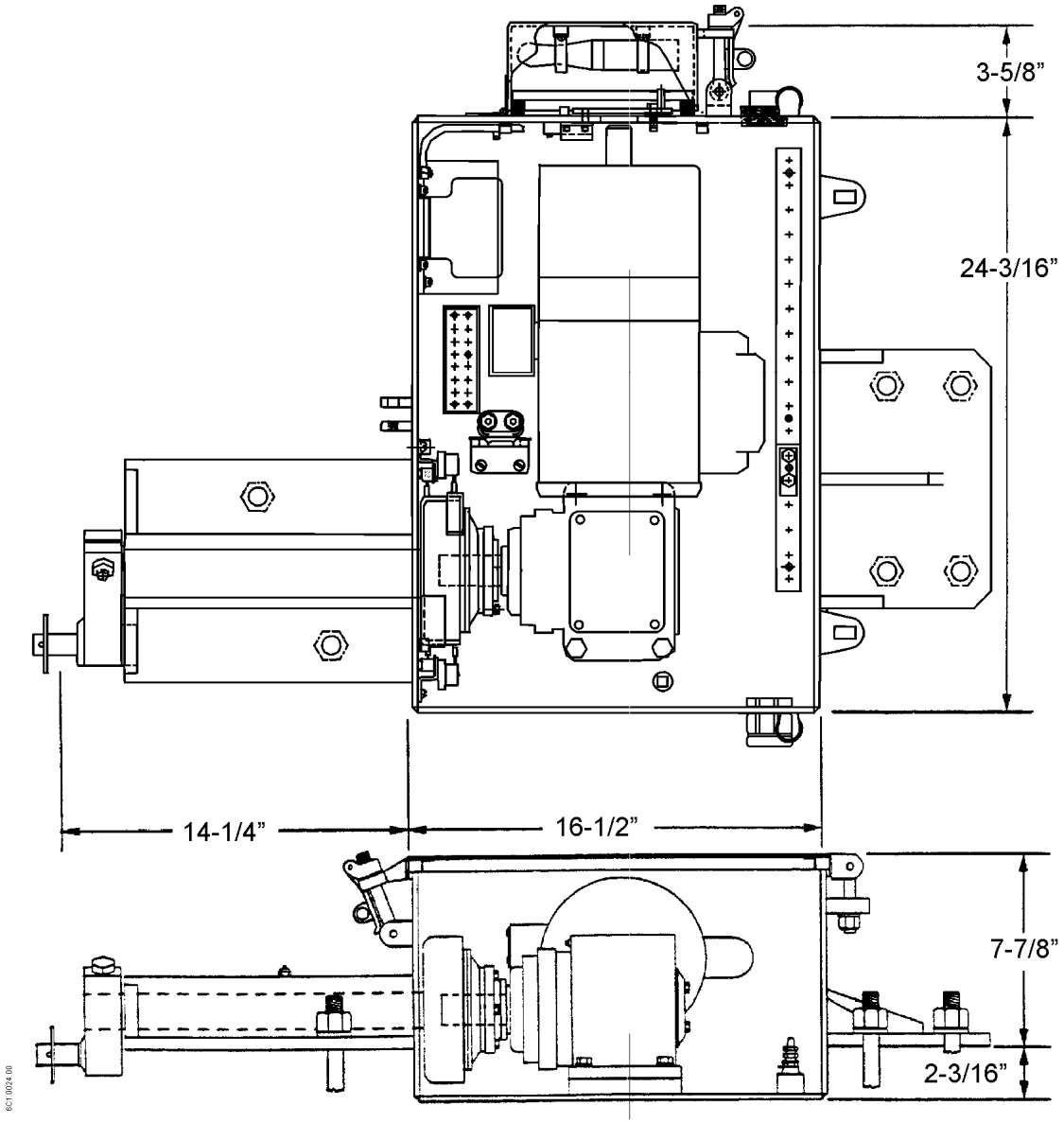
Table 2-1. General Specifications for the YM-2000™ Switch Machine

Parameter	Specification
Stroke Completion	2 seconds [at nominal voltage/70ºF (21ºC)]
Maximum Switch Throw	6 inches (15 cm)
Rated Output	1000 pounds (454 kg)
Full Throw for Manual Operation	64 turns of the hand crank
Maximum Speed for Trailing	20 mph (32 kph)
Power Input for Motor	115V ac +/- 20%, single phase, 60 Hz
Inrush Motor Current	42 amperes (during throw @ 115V ac, 60 Hz)
Maximum Motor Operating Current	15 amperes +/-10%
Normal Motor Operating Current	7-8 amperes @ 115V ac, 60 Hz
Operating Temperature Range	-40ºF to +158ºF (-40ºC to +70ºC)
Case Dimensions (Approximate) (Refer to Figure 2-2)	H = 10”, W = 16.5”, D = 29” H = 25 cm, W = 42 cm, D = 74 cm
Overall Dimensions (Approximate) (Refer to Figure 2-2)	H = 10”, W = 36”, D = 29” H = 25 cm, W = 91 cm, D = 74 cm
Weight (Approximate)	250 pounds (114 kg)



(a) Right-Hand Switch Machine

Figure 2-2. YM-2000™ Dimensions (Right Hand)



(a) Left-Hand Switch Machine

Figure 2-3. YM-2000™ Dimensions (Left Hand)

2.4.2. Contactors

The specifications for the contactors used in the YM-2000™ Switch Machines are presented in Table 2-2.

Table 2-2. Contactor Specifications for the YM-2000™ Switch Machines

Contactor	Specifications
24V dc Contactor	Minimum Pick-Up 80% = 19V dc Current = 0.150 Amperes @ 24V dc DC Coil Resistance = 155 ohms
120V dc Contactor	Minimum Pick-Up 80% = 96V dc Current = 0.083 Amperes @ 120V dc Power = 10 Watts DC Coil Resistance = 1450 ohms
120V ac Contactor	Minimum Pick-Up 80% = 96V ac Current = 0.183 Amperes @ 120V ac Power = 22 Volt-Amperes (VA) DC Coil Resistance = 92 ohms AC Impedance @ 60 Hz = 656 ohms

2.4.3. Assemblies and Functions

A listing of the assemblies used in the YM-2000™ Switch Machines and their functions is presented in Table 2-3. Refer to Figure 2-4 and Figure 2-5.

Table 2-3. YM-2000™ Assemblies and Functions

Item	Assembly	Function
1	Gear Motor	• Provides the mechanical energy for the switching action
2	Gearbox	• Transfers the power of the motor to the clutch via a worm gear mechanism
3	Contactors	• Control the energizing of the motor • Actuated by cams/switches on the clutch housing
4	Clutch	• Connects the output shaft of the gear motor to the crank shaft • Allows the switch points to shift without damage to the gear motor during a trailing move
5	Crank Shaft	• Transfers the power from the gear motor (via the clutch) to the operating crank
6	Operating Crank	• Connects the crank shaft to the switch-operating rod
7	Brake	• Prevents the motor from turning when it is not energized
8	Motor Brake Release	• Releases the electromechanical brake on the gear motor so the motor may turn freely (e.g., for manual operation)
9	Cams	• Actuate the motor control and indication switches • Mounted on the external housing of the clutch • Adjustable
10	Heater	• Prevents frost and condensation formation on the electrical contacts
11	Hand Crank	• Used for manual operation of the switch machine • Attaches to the motor armature shaft extension
12	Motor Armature Shaft Extension	• Functions as the attachment point for the hand crank • Located beneath the motor brake release
13	Operating Crank Stop	• Contacts the underside of the mounting lug to prevent overtravel of the operating crank • Mounted on the back of the operating crank

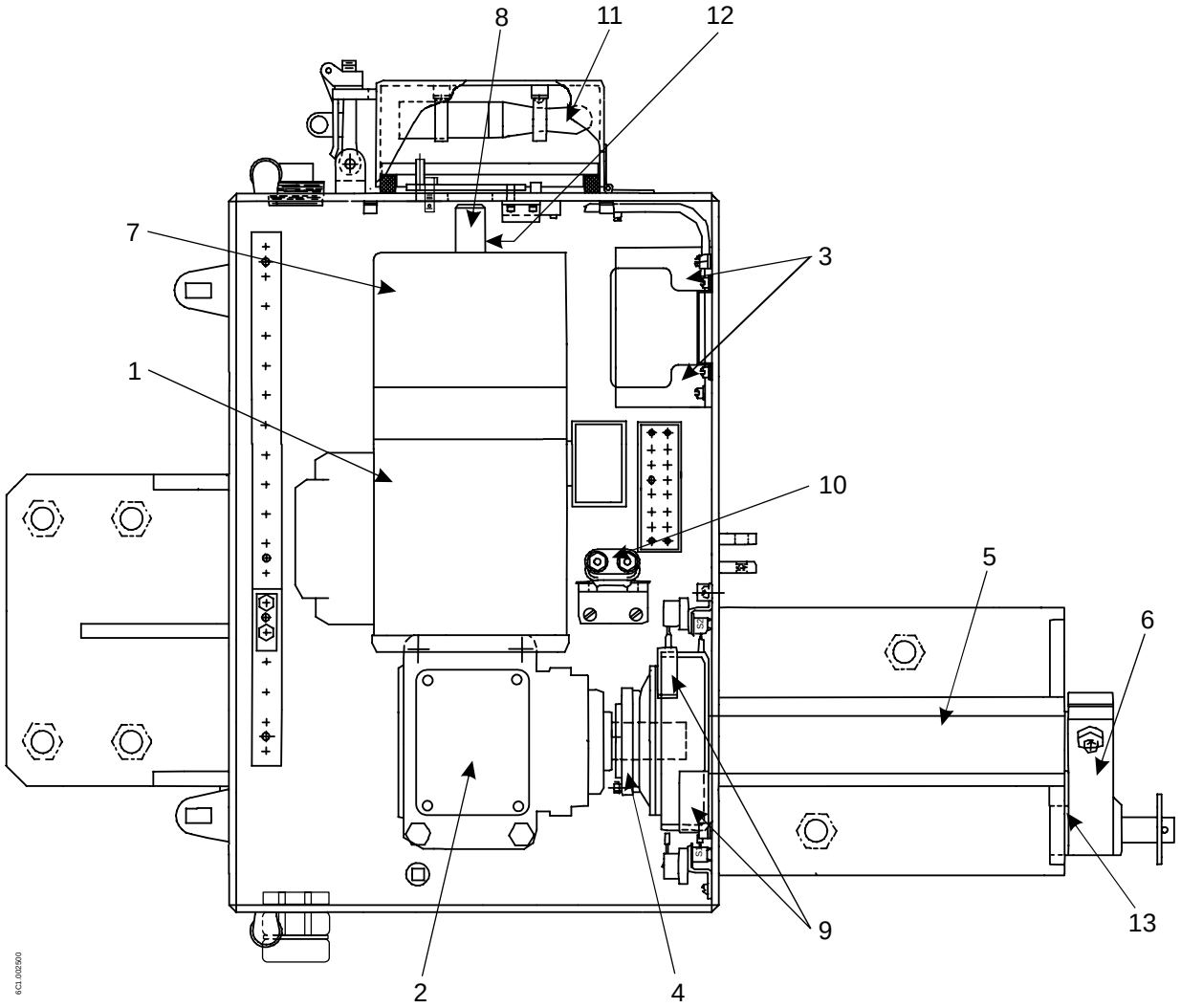


Figure 2-4, YM-2000™ Assemblies (Right Hand)

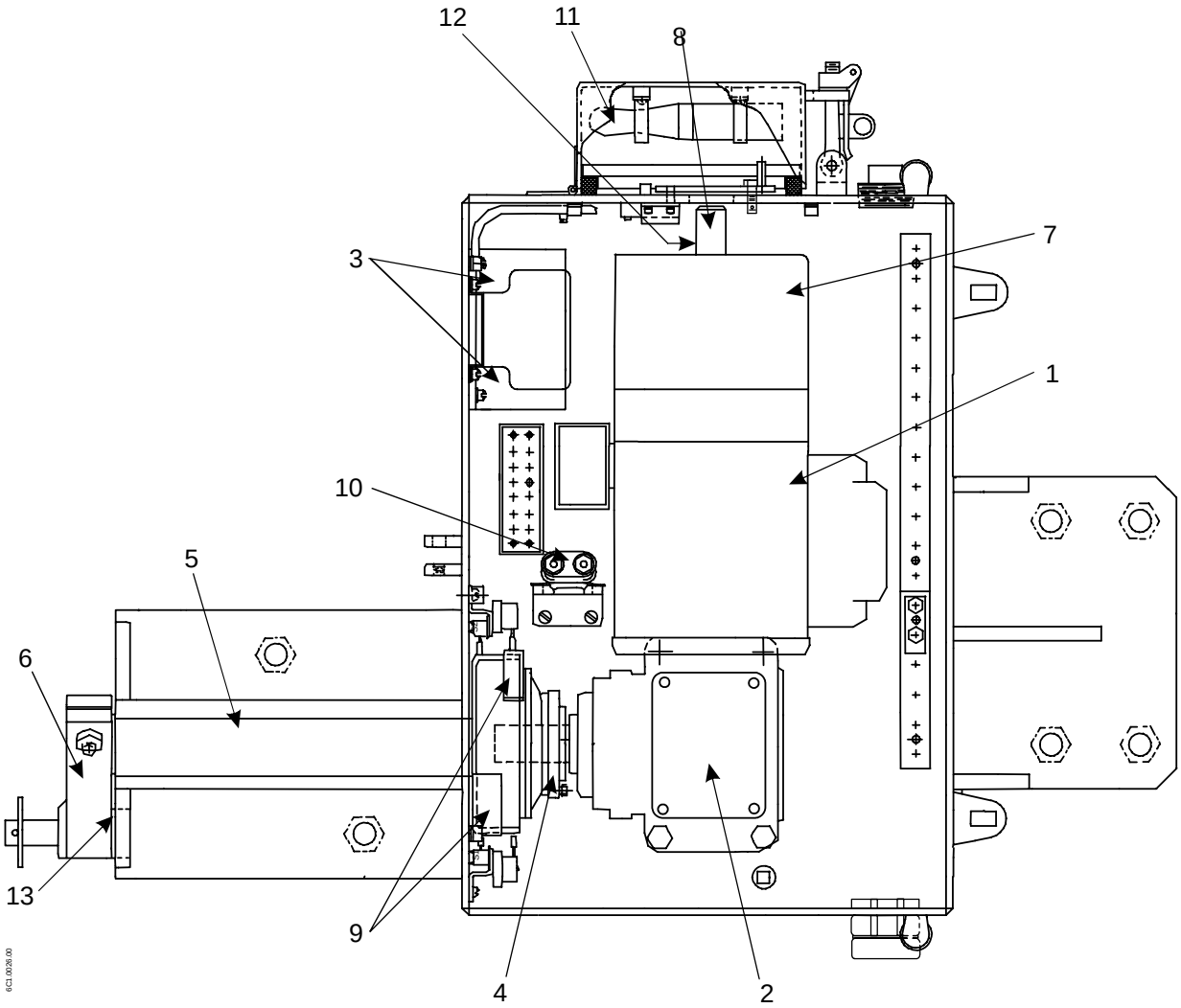


Figure 2-5. YM-2000™ Assemblies (Left Hand)

2.4.4. Electrical Control Components

A listing of the Electrical control components used on the YM-2000™ Switch Machines is presented in Table 2-4. Refer to Figure 2-6 and Figure 2-7.

Table 2-4. YM-2000™ Electrical Control Components

Item	Assembly	Function
1	Contactors R/L	• Control the connection of the power supply to the windings of the gear motor • Determine direction of rotation
2	Motor Capacitor	• Provides the required phase shift to determine the direction of motor rotation • Wired into the starting winding circuit
3	Brake Solenoid Coil	• Controls the application of the electromechanical brake to allow the gear motor to turn freely or prevent the gear motor from turning • Located inside the brake housing
4	Solid State Reversing Switch (Not shown)	• Disconnects the power supply to the starting winding when the gear motor reaches operating speed • Located inside the gear motor housing
5	Thermal Protector (Not shown)	• Disconnects the power supply to the gear motor in case of a temperature overload (e.g., blocked switch points) • Prevents damage to the gear motor • Resets automatically when cool • Located inside the gear motor housing
6	Overcurrent Protector	• Disconnects the power supply to the switch machine in case of a current overload • Resets automatically or manually
7	Motor Limit Switches SL/SR	• Disconnects the power supply to the gear motor when the switch points reach their end positions
8	Holding Circuit Switches S1/S2	• Connects the power supply to the gear motor if the switch points are forced from their end positions
9	Cut Out Switch (Hand Crank)	• Prevents the remote operation of the YM-2000™ when the access plate to the motor shaft is open for insertion of the crank
10	Motor Terminal Block	• Connects the gear motor to the power supply and control circuits • Allows easy connection/disconnection of the gear motor
11	Terminal Block	• Connects the components of the YM-2000™ with the power supply and other external connections

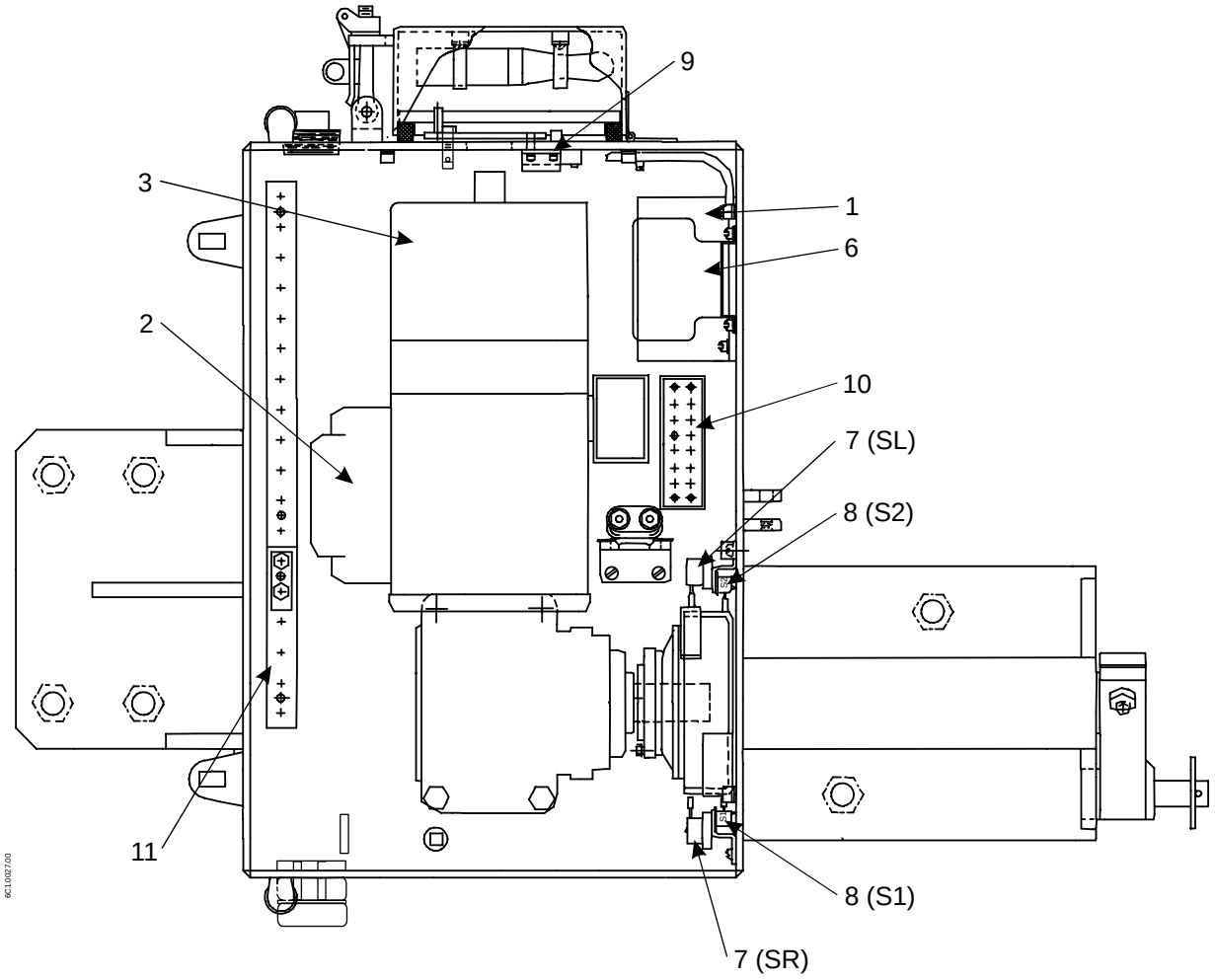


Figure 2-6. YM-2000™ Electrical Control Components (Right Hand)

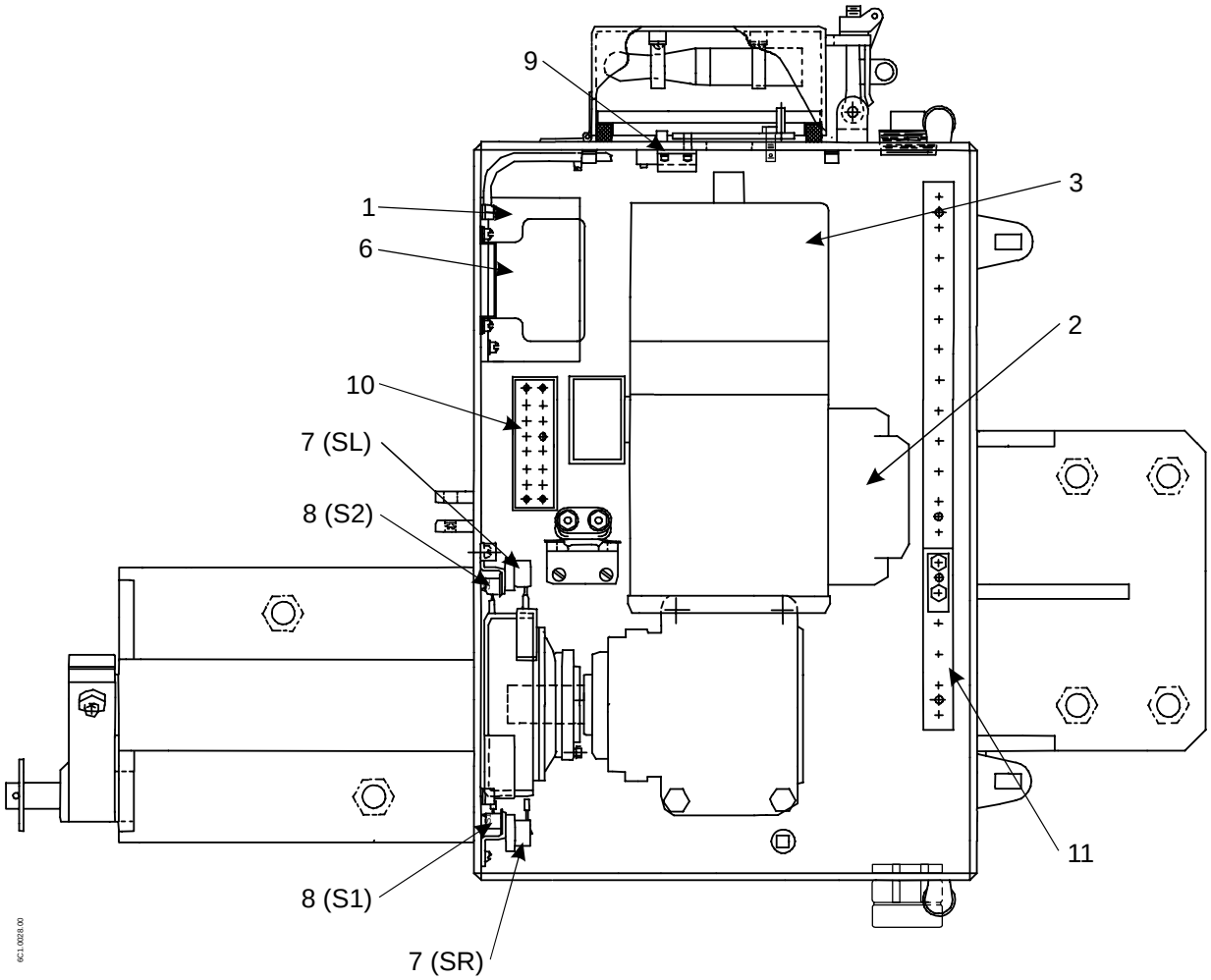


Figure 2-7. YM-2000™ Electrical Control Components (Left Hand)

3. EQUIPMENT INSTALLATION

3.1. General

Sample layouts of the right-hand and left-hand YM-2000™ Electric Switch Machines are shown in Figure 3-1, along with the following options: U-5 Switch Circuit Controller, ES-20 Color Signal, and pushbutton controls for local operation.

CAUTION

Proper drainage is required near the switch machine to prevent water damage. The installed drain plug is only intended to remove condensation that may form inside the switch machine housing.

The YM-2000™ Electric Switch Machines is available in right-hand and left-hand configurations for mounting in either left- or right-hand switch layouts. Final details of a layout, however, will be in accordance with approved railroad switch plans. The customer is provided with a detailed layout drawing, including installation dimensions and hardware requirements. Figure 3-1 presents only typical layout drawings to illustrate the working relationship of the components. The customer should refer to his own layout drawing for specific layout information.

A detector track circuit may be installed in conjunction with the YM-2000™ layout to prevent operation of the switch machine when the track circuit is occupied. If such a track circuit is used, it must be of sufficient length to allow for a two-second throw time of the switch machine. The expected traffic speed should be considered in determining the track circuit length.

3.2. Mounting

Three methods exist for mounting the YM-2000™ Switch Machine in the layout.

- The standard and recommended method for mounting the switch machine is to position the case between the ties, as shown in Figure 3-1. This method requires a minimum of 17 inches between the ties.
- The second mounting method is possible in some cases. Here, the switch machine support plate can be used as shown in Figure 3-2. In this layout, the tie spacing will be standard and tie No. 3 is of regular length. The support plate should be attached to the underside of the switch machine mounting lug using the hardware detailed on the customer layout drawing prior to setting the switch machine in place.
- The third mounting method is possible in some cases. Here, the switch machine support plate can be used as shown in Figure 3-3. In this layout, the tie spacing will be standard and tie No. 3 is of regular length. The support plate should be attached to the underside of the switch machine mounting lug using the hardware detailed on the customer layout drawing prior to setting the switch machine in place.

For all methods, the mounting procedure is basically the same.

1. Set the YM-2000™ Switch Machine in its correct location according to approved switch layout plans.

2. Drill 7/8-inch diameter holes in the ties.

3. Install the mounting 3/4-inch (20-mm) mounting studs with cast iron washers and 3/4-inch (20-mm) square nuts under the ties.

4. Install the 3/4-inch (20-mm) hex nuts and lock washers to fasten the switch machine case to the ties.

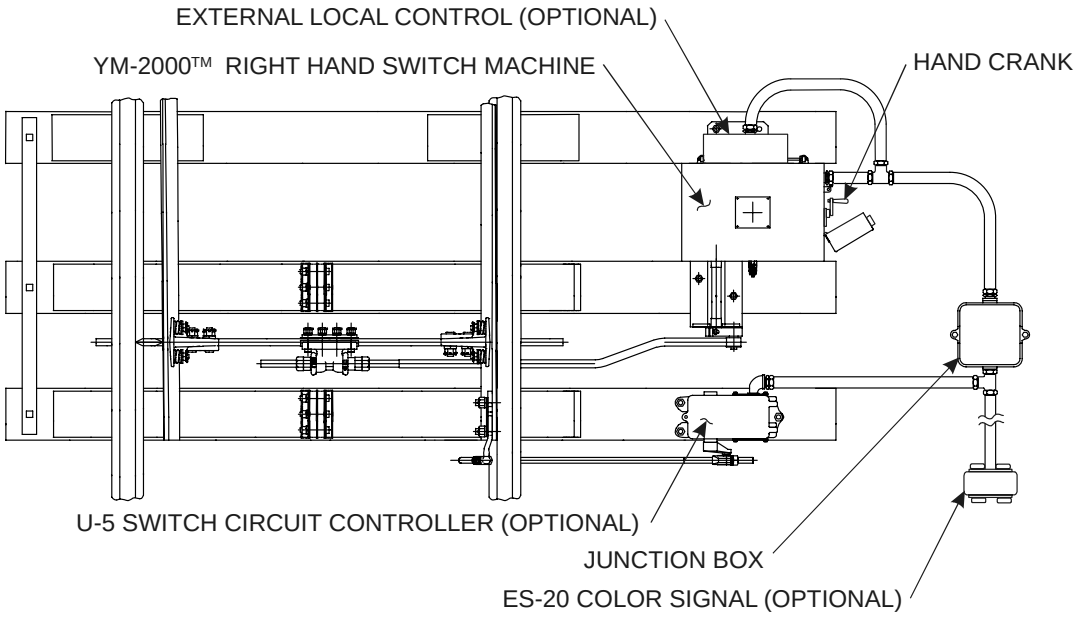
3.3. Gear Motor

The YM-2000™ is shipped with the required amount of gear oil (Mobilith SHC 007) already in the gearbox. Because this is a lifetime lubricant, replacing this grease should not be necessary.

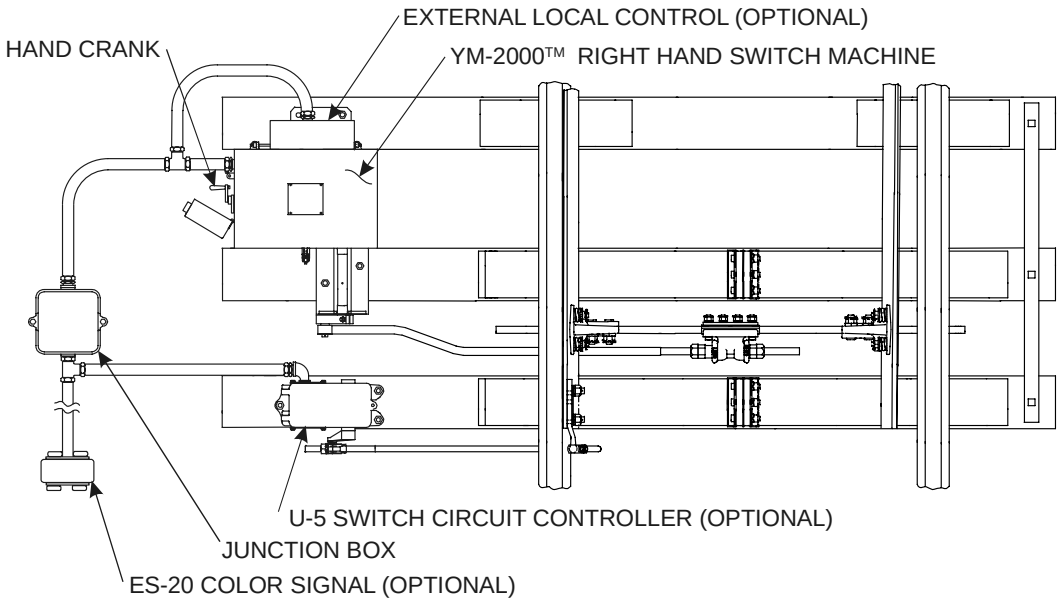
3.4. Wiring

Connect the field wiring to the terminal board according to the customer-specific wiring diagram (not included in this manual). Figure 3-4 and Figure 3-5 show a typical schematic wiring diagram for the YM-2000™ Switch Machine with 115V ac motor and 24V dc control. Figure 3-6 and Figure 3-7 illustrate a typical schematic wiring diagram for the YM-2000™ Switch Machine with 115V ac motor, 115V ac control. External circuits and wiring connections are customer-specific. The examples shown are for a right-hand layout with the left-hand point normally closed.

A 115-volt, 60-Hz, single-phase power supply is required with wiring suitable for normal operating current of 7 to 8 amperes, 11.5 to 13.0 amperes under clutch slipping conditions and 42 amperes starting inrush at 115 volts.

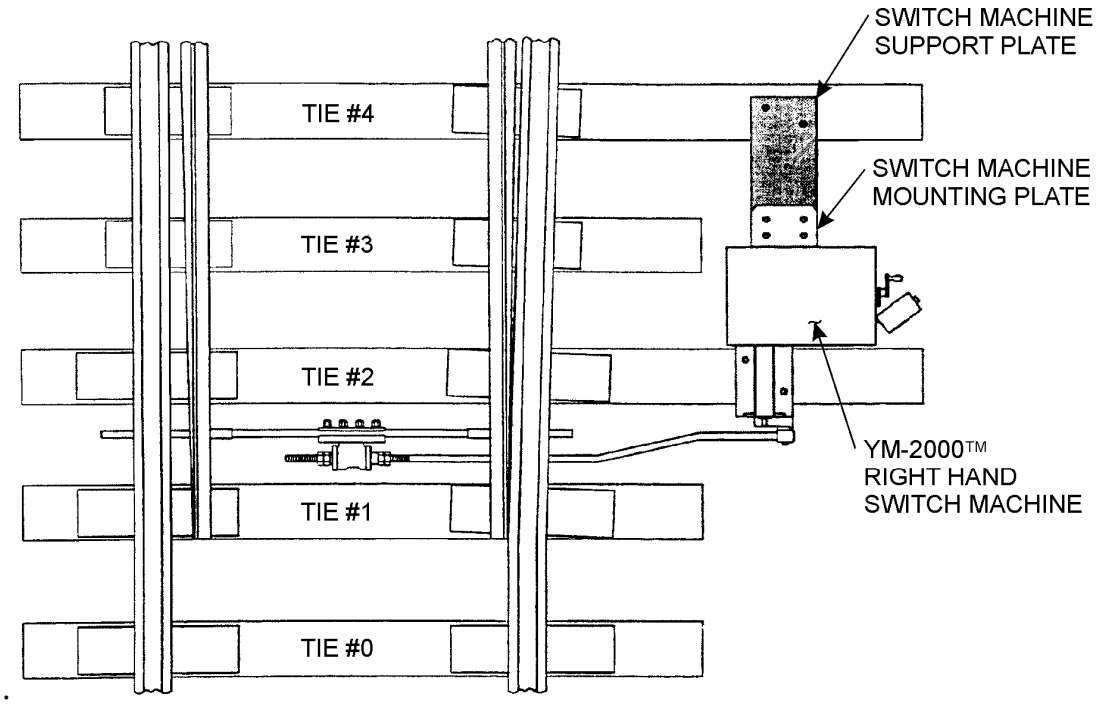


Layout Using Right Hand Switch Machine

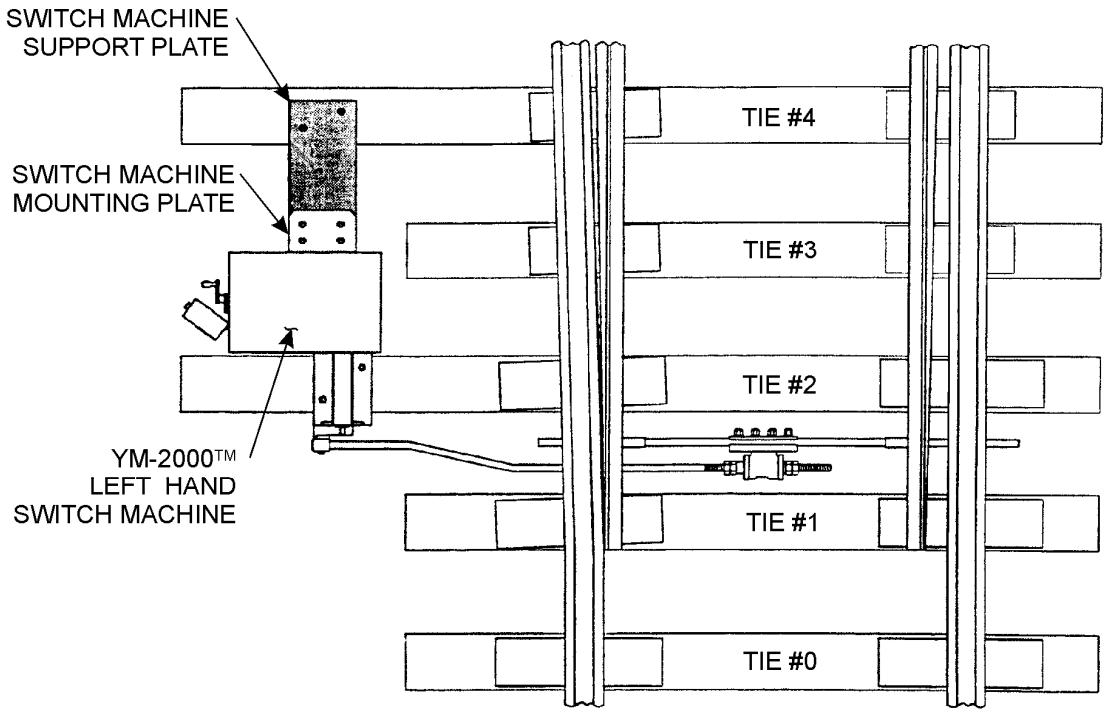


Layout Using Left Hand Switch Machine

Figure 3-1. YM-2000™ Sample Layout (Right and Left Hand Switches)

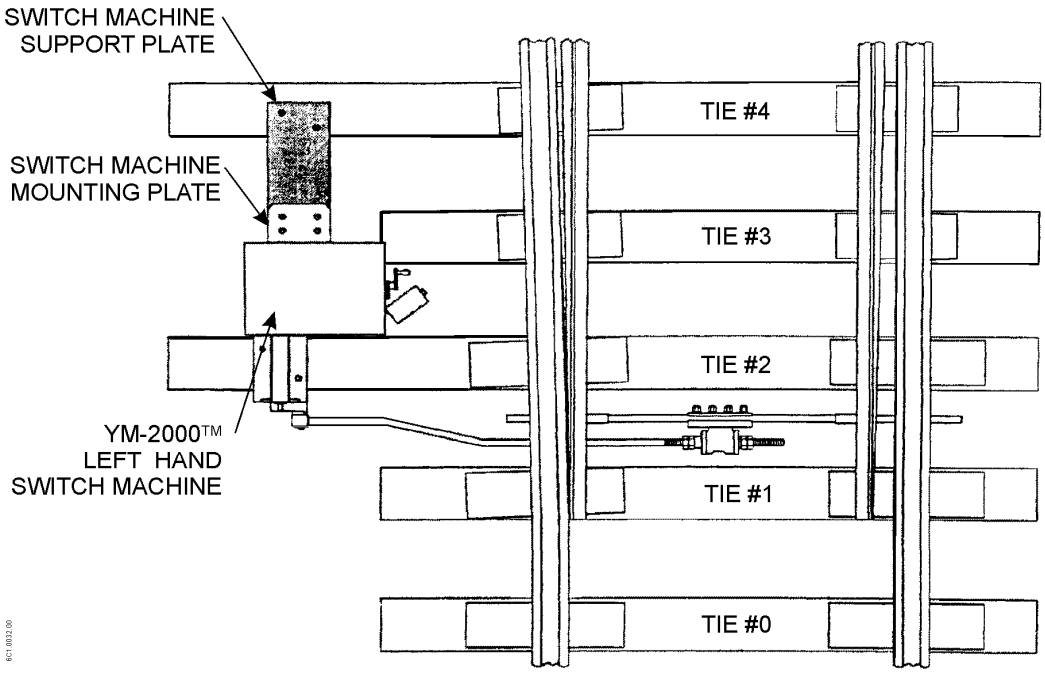


Layout Using Right Hand Switch Machine with Mounting Plate



Layout Using Left Hand Switch Machine with Mounting Plate

Figure 3-2. YM-2000™ Sample Layout Using Mounting Plate



Layout Using Left Hand Switch Machine with Mounting Plate

Figure 3-3. YM-2000™ Right Hand Machine With Left Hand Layout

3.5. Switch-Operating Rod

WARNING

To avoid personal injuries, ensure power is disconnected from the switch machine before making any adjustments.

1. Connect the switch-operating rod to the switch rod and the output crank of the YM-2000™.

2. Adjust the rod nuts at the switch basket to obtain the proper stroke of the switch points.

3. Use the hand crank to release the electromechanical brake on the motor.

4. Open the access cover (Figure 4-17) and insert the hand crank on the motor shaft extension. When the access cover is opened, power is removed from the switch machine motor and is not returned until the access cover is fully closed.

5. Manually throw the switch points back and forth.

6. The switch points must close against the stock rail just before the operating crank stop (triangular shaped piece welded to the back side of the crank arm, Item 13, Figure 2-4) contacts the underside of the switch machine mounting lug.

7. Remove the hand crank. When the hand crank is removed, the access cover will close, restoring power to the switch machine motor.

8. Operate the switch machine using motor power.

9. Since cam adjustments have been set at the factory, no further adjustment should be necessary on initial AREMA-type installations. (Refer to Section 5.4 if adjustments are required.)

10. Check that the position of the remote control switch and/or local pushbutton control corresponds to the position of the switch points.

3.6. Switch Heater

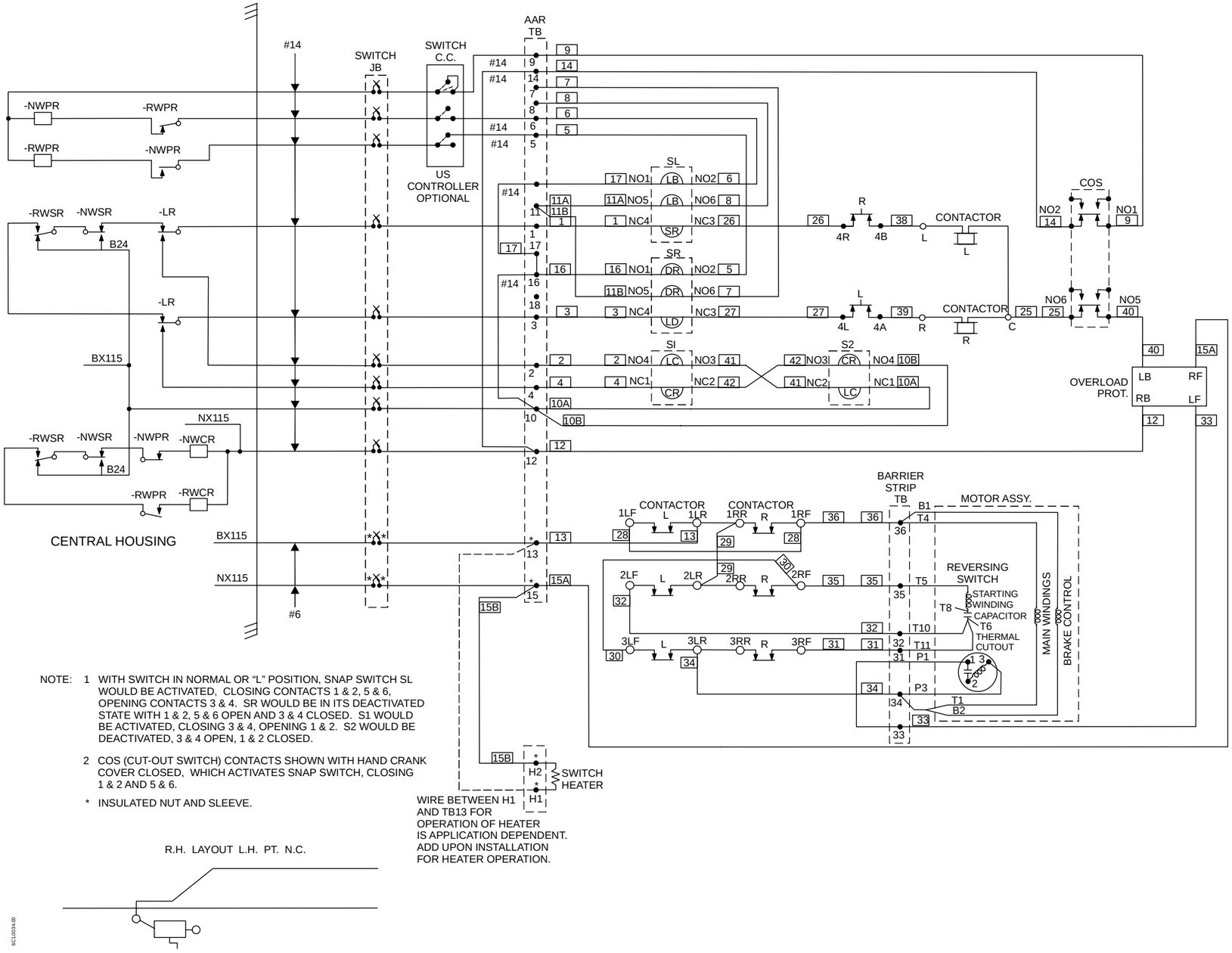
A 115 volt, 15 watt heater is provided to prevent frost formation on the electrical contacts. The heater is constantly activated if it is wired in. See Figure 3-4 or Figure 3-5.

3.7. Wiring Diagrams

A typical wiring diagram for switch machines manufactured before July 2010 is shown in Figure 3-6. A typical wiring diagram for switch machines manufactured after July 2010 is shown in Figure 3-7.

NOTE

The switch machines are shipped from the factory with a jumper connected between terminals 13 and 14. Remove the jumper if 120 VAC is not being used for switch position indication as shown in Figure 3-6 and Figure 3-7.

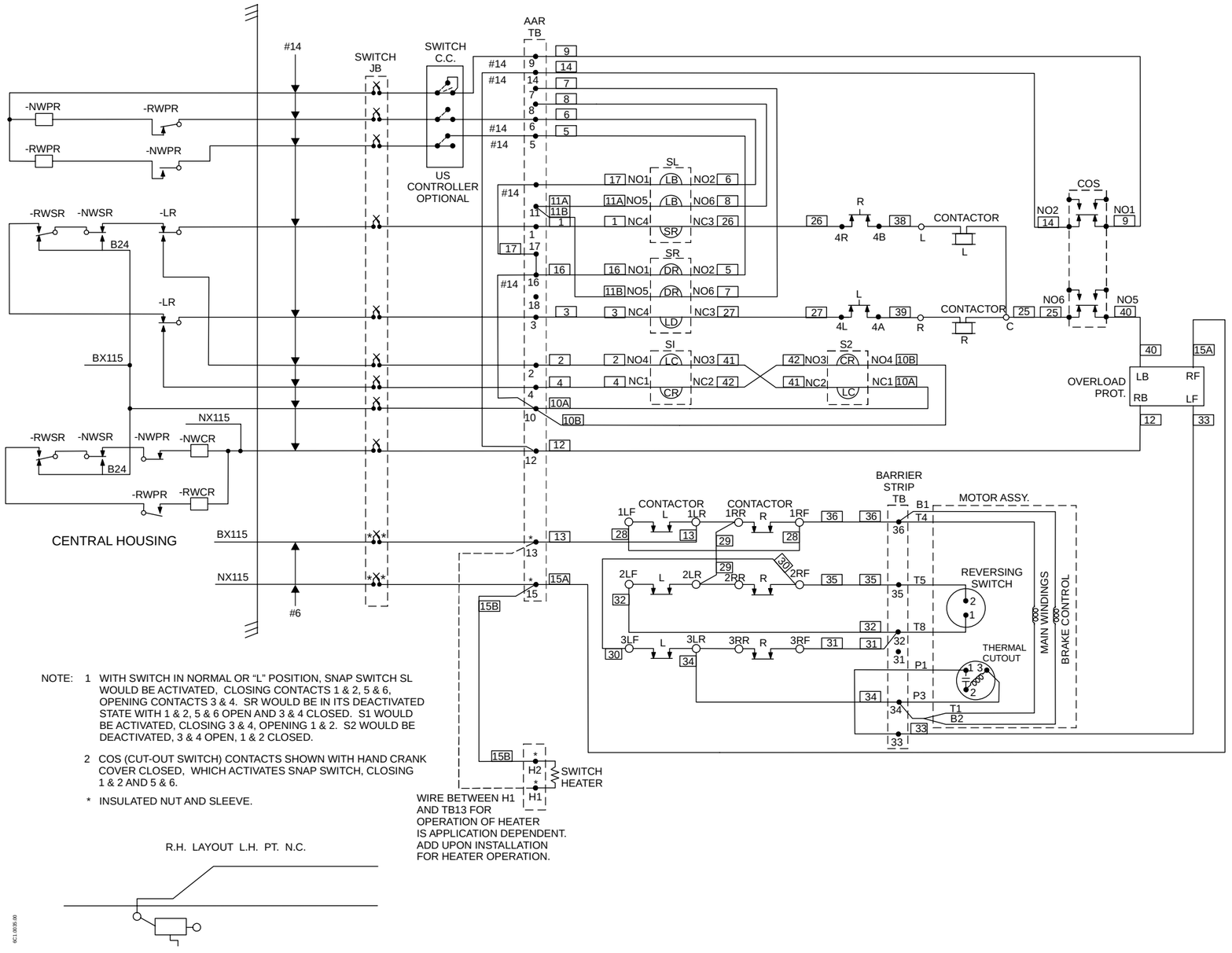


NOTE: 1 WITH SWITCH IN NORMAL OR "L" POSITION, SNAP SWITCH SL WOULD BE ACTIVATED, CLOSING CONTACTS 1 & 2, 5 & 6, OPENING CONTACTS 3 & 4. SR WOULD BE IN ITS DEACTIVATED STATE WITH 1 & 2, 5 & 6 OPEN AND 3 & 4 CLOSED. S1 WOULD BE ACTIVATED, CLOSING 3 & 4, OPENING 1 & 2. S2 WOULD BE DEACTIVATED, 3 & 4 OPEN, 1 & 2 CLOSED.

2 COS (CUT-OUT SWITCH) CONTACTS SHOWN WITH HAND CRANK COVER CLOSED, WHICH ACTIVATES SNAP SWITCH, CLOSING 1 & 2 AND 5 & 6.

* INSULATED NUT AND SLEEVE.

Figure 3-4. Typical Wiring Diagram With Switch Heater For Switch Machines Manufactured Before July 2010



NOTE: 1 WITH SWITCH IN NORMAL OR "L" POSITION, SNAP SWITCH SL WOULD BE ACTIVATED, CLOSING CONTACTS 1 & 2, 5 & 6, OPENING CONTACTS 3 & 4. SR WOULD BE IN ITS DEACTIVATED STATE WITH 1 & 2, 5 & 6 OPEN AND 3 & 4 CLOSED. S1 WOULD BE ACTIVATED, CLOSING 3 & 4, OPENING 1 & 2. S2 WOULD BE DEACTIVATED, 3 & 4 OPEN, 1 & 2 CLOSED.

2 COS (CUT-OUT SWITCH) CONTACTS SHOWN WITH HAND CRANK COVER CLOSED, WHICH ACTIVATES SNAP SWITCH, CLOSING 1 & 2 AND 5 & 6.

* INSULATED NUT AND SLEEVE.

Figure 3-5. Typical Wiring Diagram With Switch Heater For Switch Machines Manufactured After July 2010

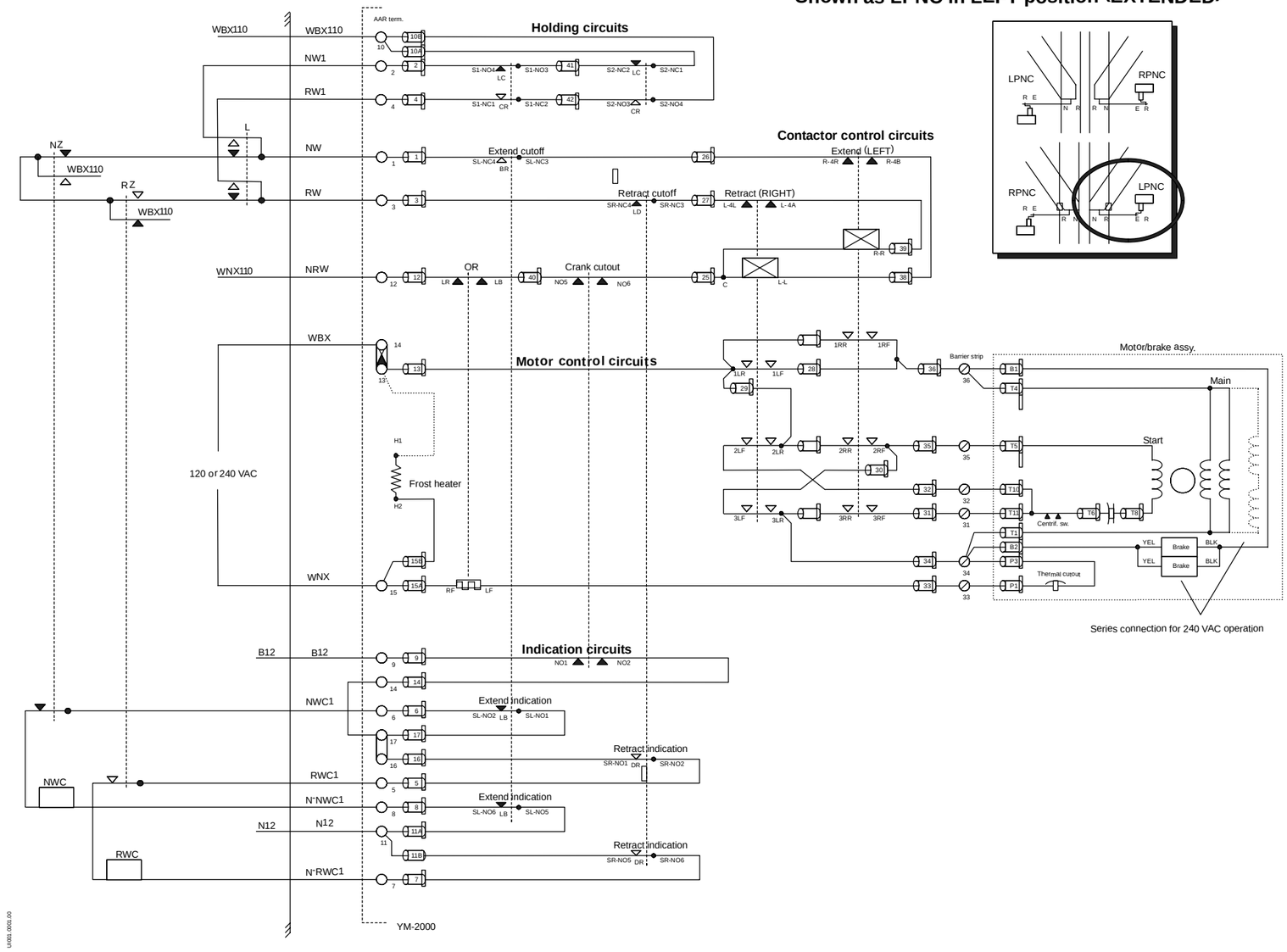


Figure 3-6. Typical Wiring Diagram For Switch Machine Manufactured Before July 2010

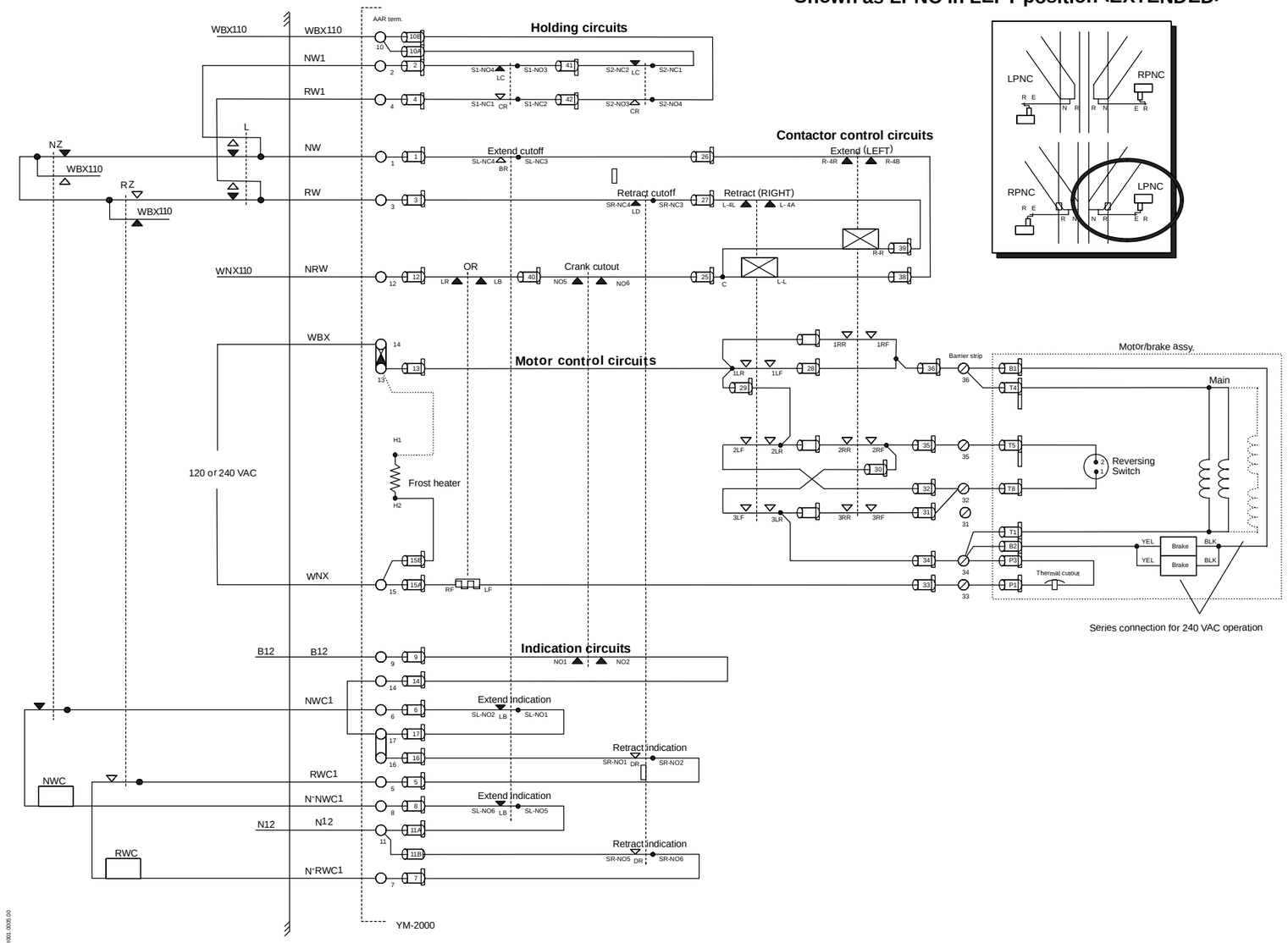


Figure 3-7. Typical Wiring Diagram For Switch Machines Manufactured After July 2010

4. OPERATION

4.1. Remote Operation

The motor is controlled by two contactors, “R” and “L.” With the remote control switch in either normal or reverse position, the corresponding contactor energizes and remains energized until the completion of the stroke. See Figure 4-1, Figure 4-2, and Figure 4-3 for contactor and cam locations and orientation.

The gear motor starts with the auxiliary (starting) winding, primary (running) winding, and brake solenoid coil all connected in parallel. A capacitor, mounted on the side of the motor and connected in series with the auxiliary (starting) winding, provides the required phase shift to generate torque during the starting operation. When the solenoid coil is energized, the brake on the motor armature shaft is released. A solid state starting switch disconnects the auxiliary (starting) winding circuit when the proper motor speed is obtained, and the motor operates on the primary (running) winding only. The inrush current is approximately 42 amperes (115V ac). After the initial surge, the normal motor operating current is approximately 7 to 8 amperes (115V ac). The motor is instantly reversible.

The YM-2000™ is protected by both a thermal overload protector and a current overload protector. If the motor overheats, a thermal overload switch, located in the motor housing, will automatically open the circuit and disconnect the motor from the power supply before the motor is damaged. After the motor has cooled sufficiently, the thermal overload switch will automatically reset itself. In the case of a current overload, the overload switch (located above the motor contactors) will automatically open the circuit and disconnect the entire switch machine from the power supply. This overload switch is set at the factory to reset automatically (in approximately 1-½ minutes). The overload switch can also be set to require a manual reset. Following a reset caused by either a thermal or current overload, the switch machine will continue with its last received command.

Two motor limit switches, “SR” and “SL,” are used to deactivate the gear motor when the switch has been fully thrown. Cams mounted on the clutch housing actuate the appropriate limit switch at the end of each stroke. The actuated limit switch then deenergizes the appropriate motor contactor, R or L. This disconnects the power supply to both the motor and the solenoid coil of the electromechanical brake. Thus, the motor stops and the springs of the brake apply the brake to the motor armature shaft. The deenergization of the motor contactor also energizes the appropriate signal lamp of the optional ES-20 Electrical Switch Signal (or H-2 Dwarf Signal), when installed, to indicate the position of the switch points.

Inserting the hand crank into the motor Armature Shaft Extension will also remove power from the switch machine motor. When the access cover for the hand crank is lifted a cutout switch removes power from the motor. Power is restored when the hand crank is removed and the access cover is completely closed.

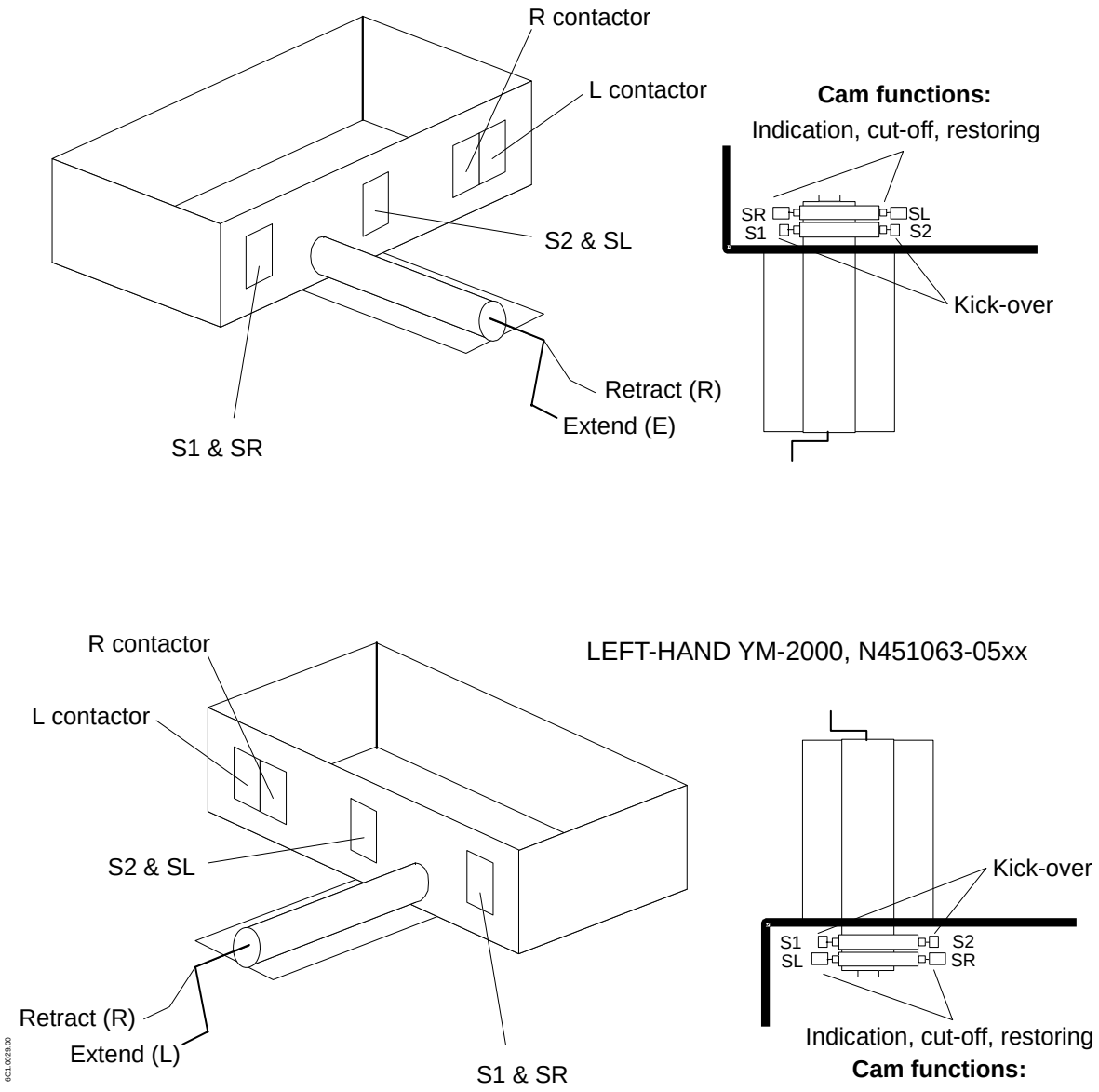


Figure 4-1. YM-2000 Key Component Orientation

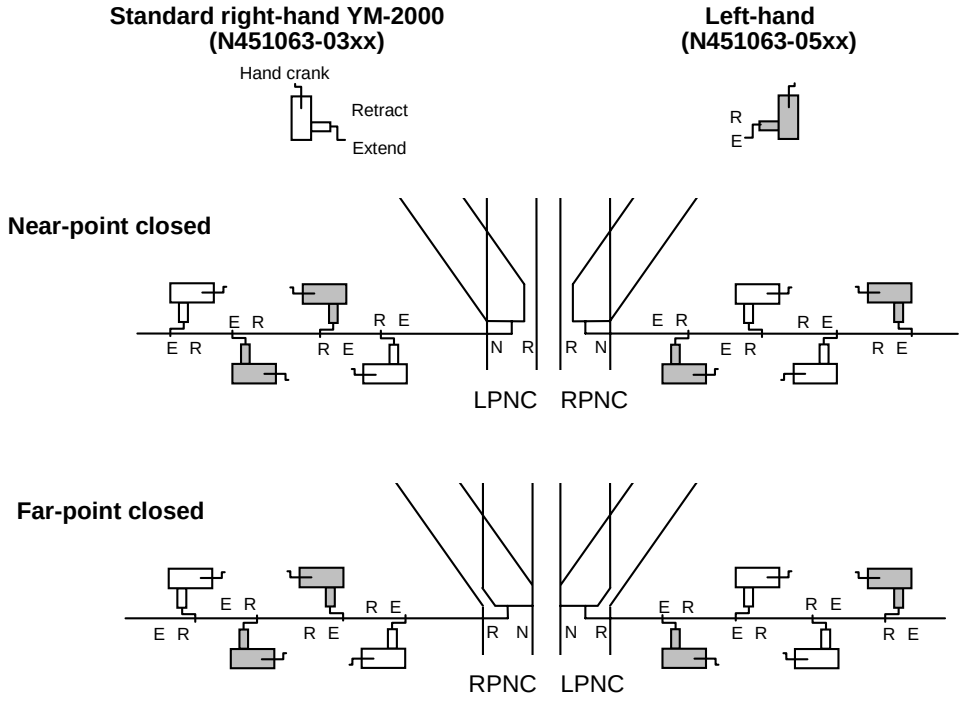


Figure 4-2. YM-2000 Machine and Layout Orientation

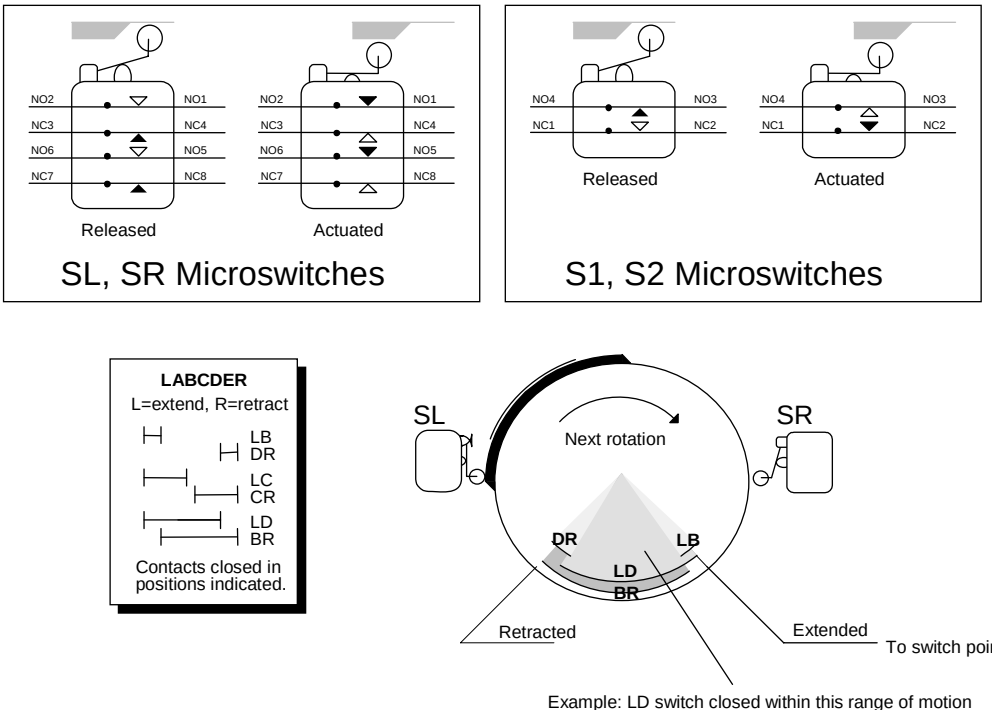


Figure 4-3. YM-2000 Microswitch Contact Configuration & Operating Sequence

4.2. Trailing Operation

In addition to remote control, the motor contactors may also be energized during a trailing move. When the wheels of a car or locomotive force open the switch points during a trailing move, the resulting force is transmitted through the switch-operating rod to the operating crank. Since the gear motor is driven by a worm gear that is inherently self-locking, this force will not cause the motor to rotate backwards. However, the operating crank will rotate because the friction clutch on the output shaft of the gear motor slips. When the clutch slips, the holding circuit is energized by the cam actuated switches, S1 and S2.

The final position to which the switch points will be driven subsequent to a trailing move depends on which holding circuit switch, S1 or S2, is operated. If the crank arm is forced past its center position, the switch points will be driven to a final position agreeing with the trailing movement, i.e., the switch will throw to the opposite position. If the crank arm is not forced past its center position, the switch points will be driven to a final position in disagreement with the trailing movement, i.e., the switch will return to its position prior to the trailing move. Therefore, the switch machine initially opposes the trailing move. When the points are forced open, the YM-2000™ attempts to drive them back to the fully thrown position, i.e., as if the points had crept away from the closed position. But if they are forced more than half way, e.g., by the wheels of a car or locomotive, the YM-2000™ completes the throw.

If the YM-2000™ is trailed during an electrical power failure, the switch points will remain in the position to which they are forced by the trailing move. When power is restored, the movement of the switch points will be dependent on which holding circuit switch, S1 or S2, is actuated. If the crank arm was forced past its center position, the switch points will be driven to a final position agreeing with the trailing movement. If the crank arm was not forced past its center position, the switch points will be driven to a final position in disagreement with the trailing movement. (If a track circuit is present and is unoccupied when power is restored, the switch points will be driven to a position agreeing with the position called by the remote control circuits.)

4.3. Control and Indication Switches and Cams

There are four control and indication switches mounted next to the clutch housing. Two of these switches (SL and SR) control the connection of the power supply to the gear motor. The other two switches (S1 and S2) comprise the holding circuit.

Each of the four switches is essentially the same (See Figure 4-4). The switch is actuated by a metal bar that presses against the switch button. This metal bar, or actuator, has a roller at one end and is attached at the other end to the switch body via a pivot. When the roller rides up on the cam mounted on the clutch housing, the actuator pivots and bears against the switch button, which actuates the switch.

The switch is mounted on a bracket that allows adjustment of the clearance between the clutch housing and the roller of the switch when the switch is in its open position.

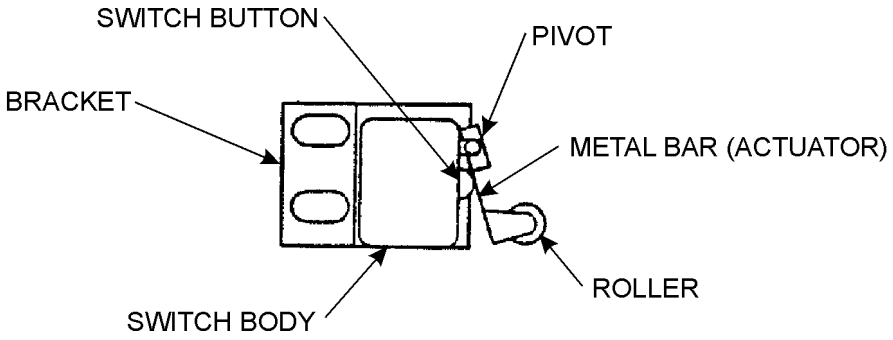


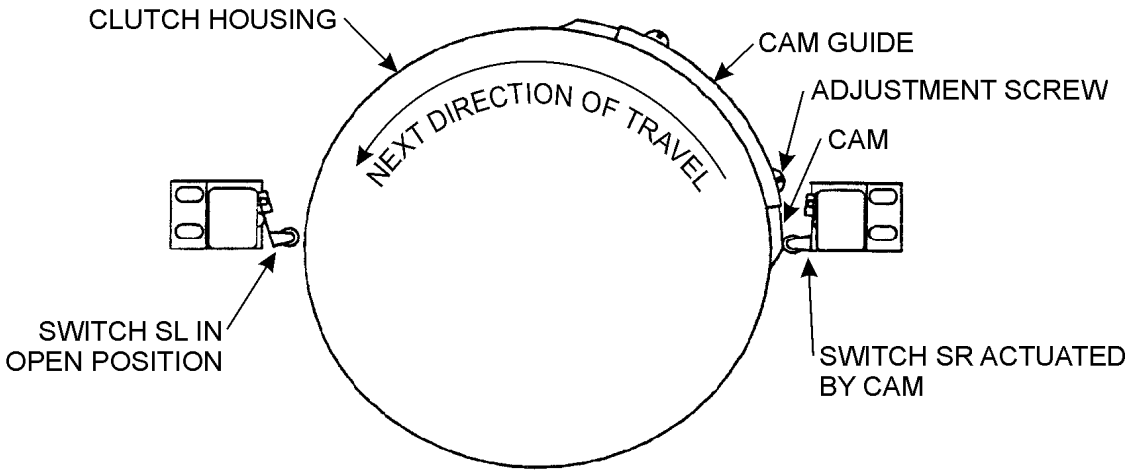
Figure 4-4. Control and Indication Switches

4.4. Motor Limit and Holding Circuit Switches and Cams

4.4.1. Right-Hand Machine Motor Limit Switches and Cams

The connection of the power supply to the gear motor is controlled by two switches (SL and SR). When either of these switches is actuated, the motor is de-energized.

Figure 4-5 shows the switches (SL and SR) and the cams that actuate these switches. The view shown is looking from the gearbox towards the operating crank. Switch SR is in its actuated position, i.e., the roller of Switch SR is on top of the cam and the actuator is pressing against the switch button. Therefore, the gear motor is de-energized. The cams that actuate Switches SL and SR are mounted against the clutch housing in a cam guide. One adjustment screw holds each cam in place. Since the cam is positioned to actuate Switch SR, Switch SL is in its open position.



NEAR Point Closed for Right Hand Layout

Figure 4-5. Motor Limit Switches (SR Activated)

When the gear motor is energized by an external signal (e.g., remote control from a yard office or local pushbutton) the gear motor drives the switch points to their opposite position, which causes the clutch housing to rotate. As the clutch housing rotates, the roller of Switch SR rides down from the cam; and the switch is returned to its open position. Figure 4-6 shows the clutch housing near its mid-stroke position. Both switches are in their open positions. This means that the gear motor will remain energized until either switch (SL or SR) is actuated.

The motor remains energized and the clutch continues to rotate until the roller of Switch SL rides up on the cam and the actuator presses against the switch button, as shown in Figure 4-7. The gear motor is then de-energized. Note that Switch SR is in its open position.

4.4.2. Right-Hand Machine Holding Circuit Switches and Cams

The gear motor is energized when the YM-2000™ receives an external signal, e.g., remote control from a yard office, local pushbutton, etc. The gear motor is also energized if the switch points are forced from their fully thrown position. This is accomplished via the holding circuit, which is controlled by two switches (S1 and S2). The actuation of one of these switches determines the direction of motor rotation.

Figure 4-8 shows the switches (S1 and S2) and the cams that actuate these switches. The view shown is looking from the gearbox towards the operating crank. Switch S1 is in its actuated position, i.e., the roller of Switch S1 is on top of the cam and the actuator is pressing against the switch button. The cams that actuate Switches S1 and S2 are mounted against the clutch housing. Two adjustment screws hold each cam in place. Since the S1 cam is in position to actuate Switch S1, Switch S2 is in its open position.

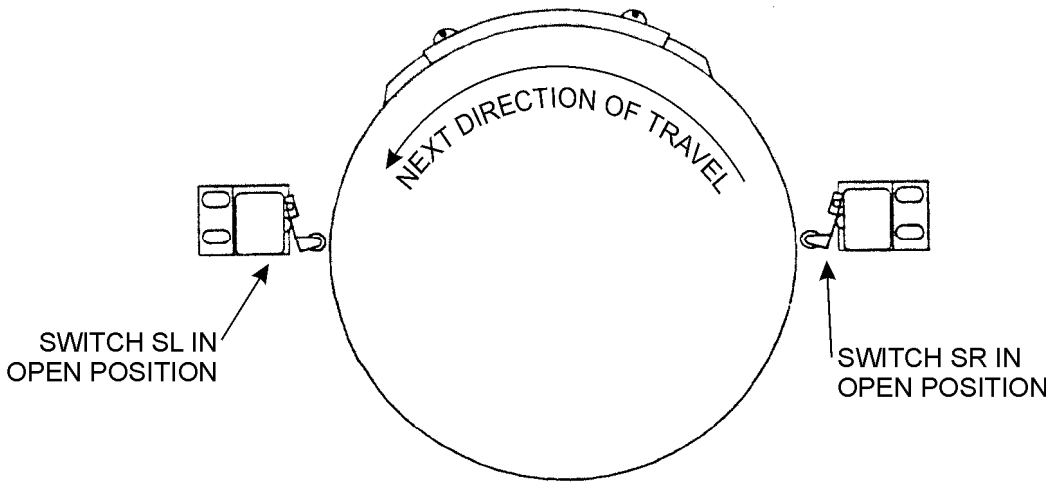
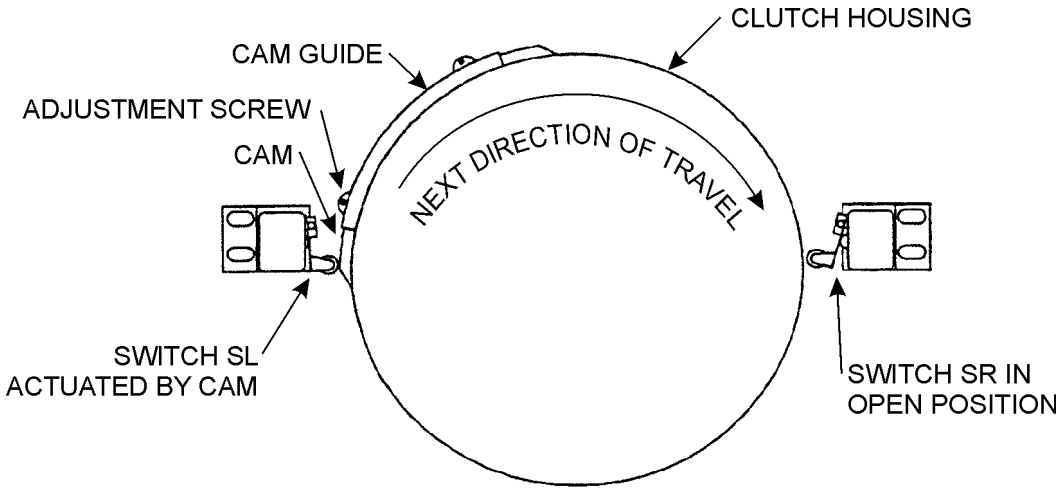
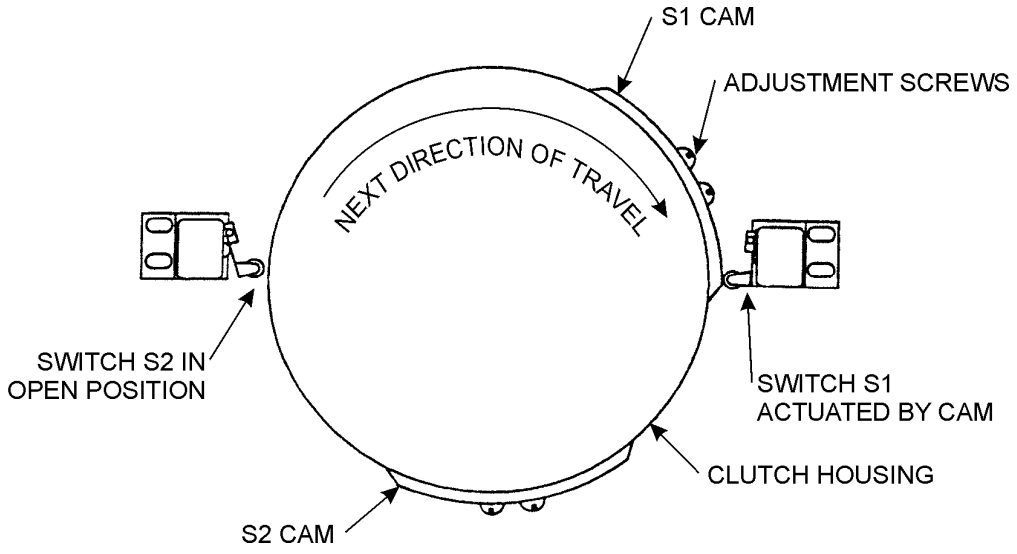


Figure 4-6. Motor Limit Switches (Mid-Stroke Position)



FAR Point Closed for Right Hand Layout

Figure 4-7. Motor Limit Switches (SL Actuated)



FAR Point Closed for Right Hand Layout

Figure 4-8. Holding Circuit Switches (S1 Actuated)

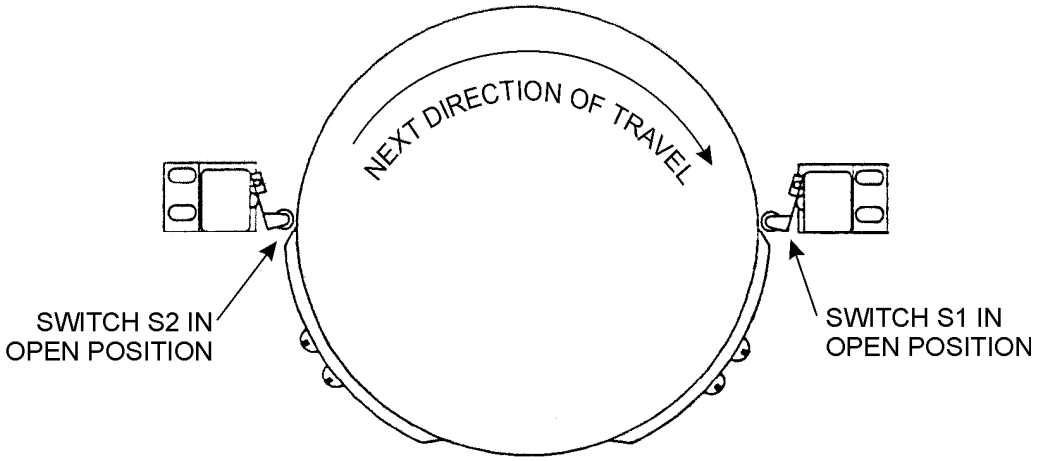


Figure 4-9. Holding Circuit Switches (Mid-Stroke Position)

If the points are forced open, e.g., during a trailing move, the clutch housing will rotate so that either Switch SL or SR changes from the actuated position to its open position (refer to Section 3.3.2). This energizes the gear motor. The direction of rotation of the gear motor depends on the position of the clutch housing. If the clutch housing rotates less than half way, Switch S1 will remain actuated. Therefore, the gear motor will rotate to drive the switch points back to their original position.

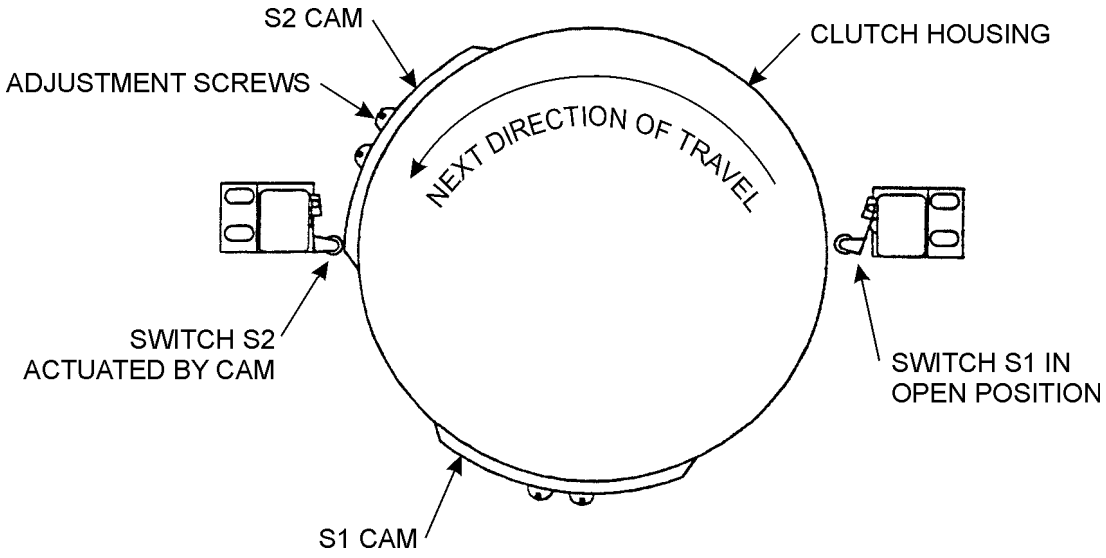
If the rotation of the clutch housing reaches the halfway point, the roller of Switch S1 rides down from the S1 cam, and Switch S1 is returned to its open position. At the exact halfway point, both switches are in their open positions, as shown Figure 4-9. This prevents the holding circuit from energizing both contactors at the same time.

As the clutch housing rotates past the halfway point, the roller of Switch S2 rides up on the S2 cam and the actuator presses against the switch button, as shown Figure 4-11. Thus, Switch S2 is actuated, and the gear motor will reverse and rotate in a direction to throw the switch points to the opposite position.

4.4.3. Left-Hand Machine Motor Limit Switches and Cams

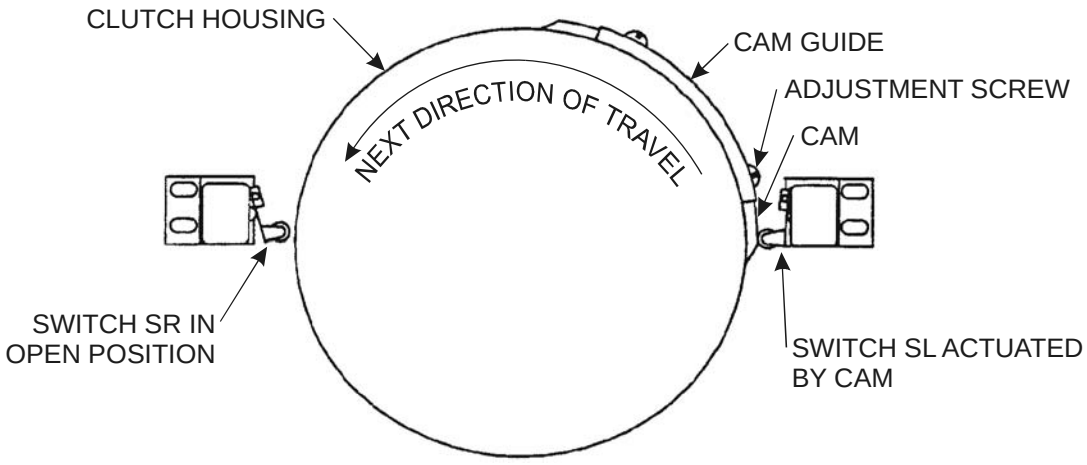
The connection of the power supply to the gear motor is controlled by two switches (SL and SR). When either of these switches is actuated, the motor is de-energized.

Figure 4-11 shows the switches (SL and SR) and the cams that actuate these switches. The view shown is looking from the gearbox towards the operating crank. Switch SL is in its actuated position, i.e., the roller of Switch SL is on top of the cam and the actuator is pressing against the switch button. Therefore, the gear motor is de-energized. The cams that actuate Switches SL and SR are mounted against the clutch housing in a cam guide. One adjustment screw holds each cam in place. Since the cam is positioned to actuate Switch SL, Switch SR is in its open position.



NEAR Point Closed for Right Hand Layout

Figure 4-10. Holding Circuit Switches (S2 Actuated)



FAR Point Closed for Left Hand Layout

Figure 4-11. Motor Limit Switches (SL Activated)

When the gear motor is energized by an external signal, e.g., remote control from a yard office or local pushbutton, the gear motor drives the switch points to their opposite position, which causes the clutch housing to rotate. As the clutch housing rotates, the roller of Switch SL rides down from the cam; and the switch is returned to its open position. Figure 4-12 shows the clutch

housing near its mid-stroke position. Both switches are in their open positions. This means that the gear motor will remain energized until either switch (SL or SR) is actuated.

The motor remains energized and the clutch continues to rotate until the roller of Switch SR rides up on the cam and the actuator presses against the switch button, as shown in Figure 4-13. The gear motor is then de-energized. Note that Switch SL is in its open position.

4.4.4. Left-Hand Machine Holding Circuit Switches and Cams

The gear motor is energized when the YM-2000™ receives an external signal, e.g., remote control from a yard office, local pushbutton, etc. The gear motor is also energized if the switch points are forced from their fully thrown position. This is accomplished via the holding circuit, which is controlled by two switches (S1 and S2). The actuation of one of these switches determines the direction of motor rotation.

Figure 4-14 shows the switches (S1 and S2) and the cams that actuate these switches. The view shown is looking from the gearbox towards the operating crank. Switch S2 is in its actuated position, i.e., the roller of Switch S2 is on top of the cam and the actuator is pressing against the switch button. The cams that actuate Switches S1 and S2 are mounted against the clutch housing. Two adjustment screws hold each cam in place. Since the S2 cam is in position to actuate Switch S2, Switch S1 is in its open position.

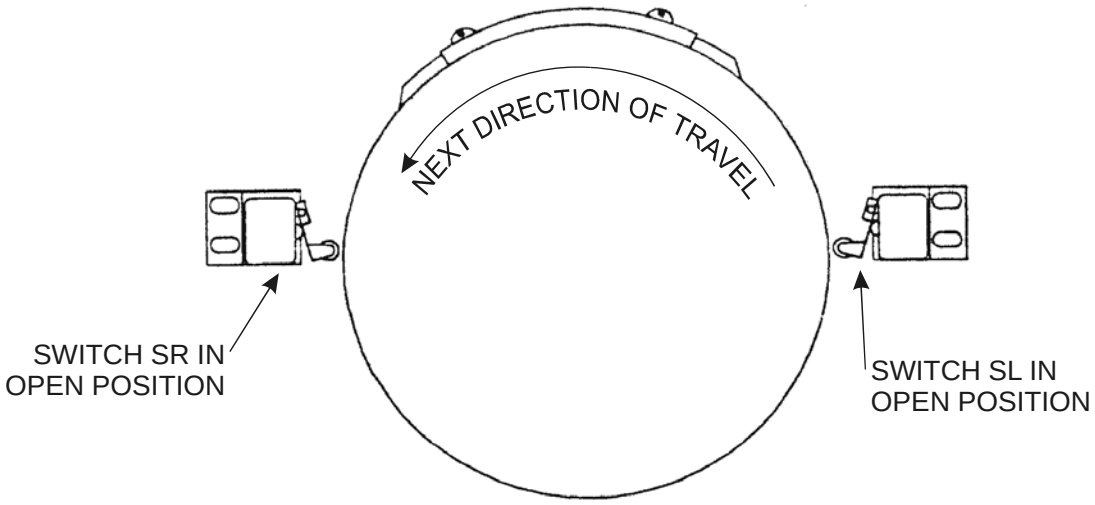
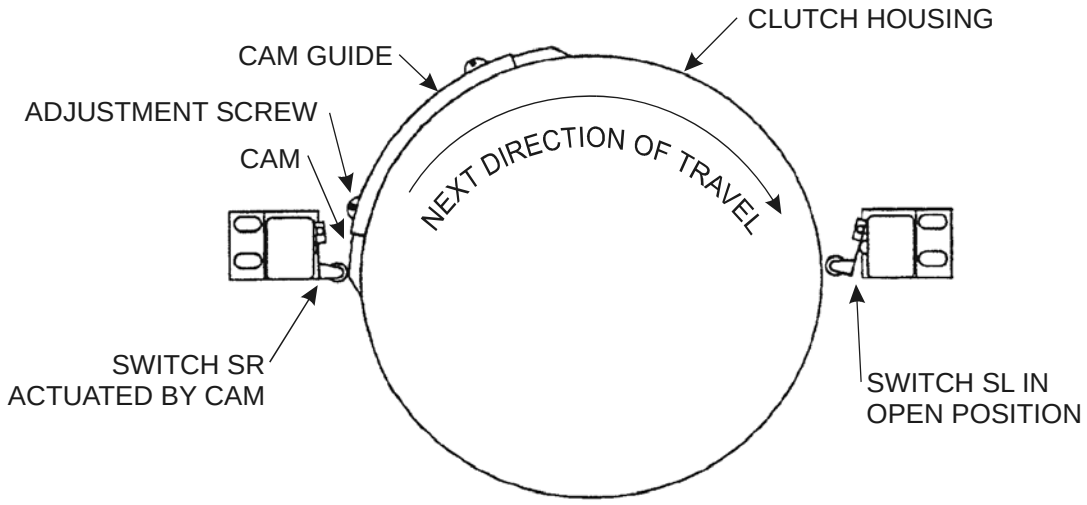
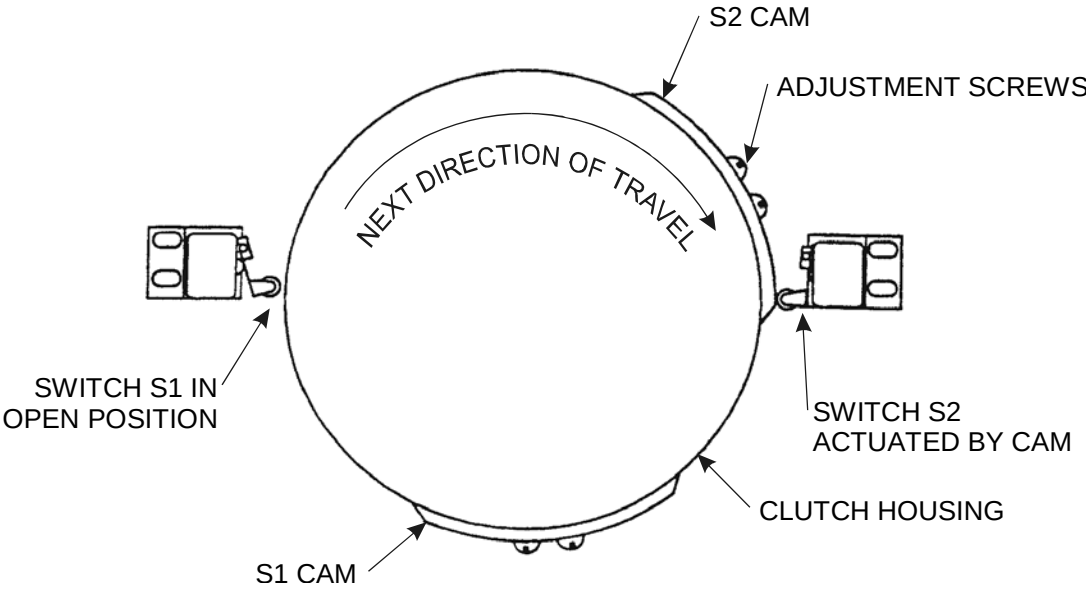


Figure 4-12. Motor Limit Switches (Mid-Stroke Position)



NEAR Point Closed for Left Hand Layout

Figure 4-13. Motor Limit Switches (SR Actuated)



NEAR Point Closed for Left Hand Layout

Figure 4-14. Holding Circuit Switches (S1 Actuated)

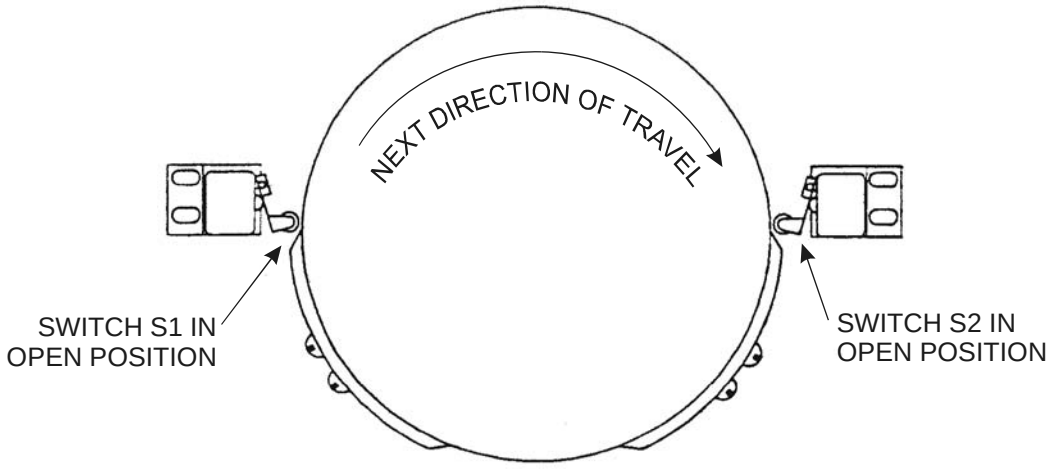
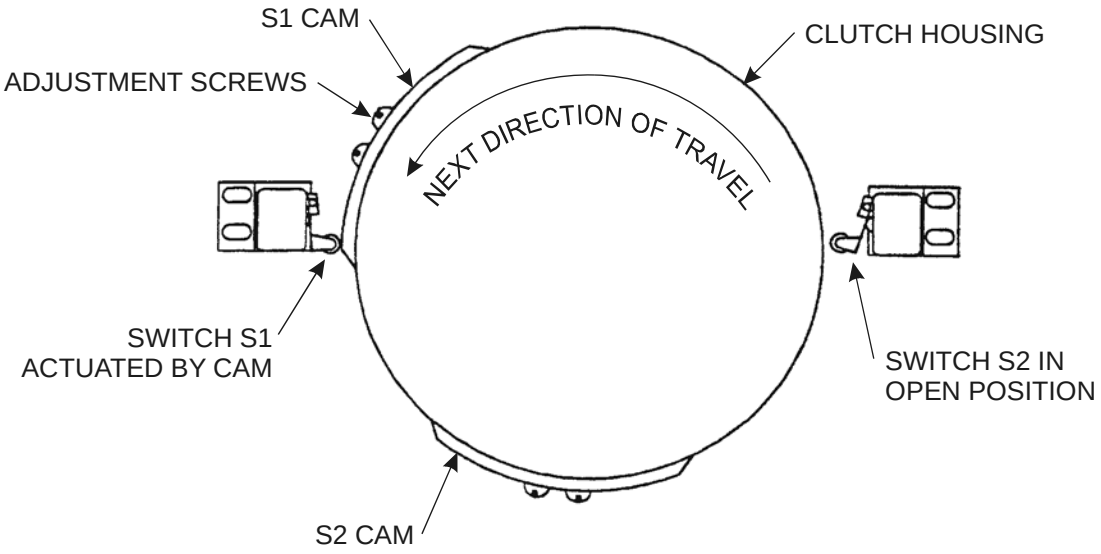


Figure 4-15. Holding Circuit Switches (Mid-Stroke Position)



FAR Point Closed for Left Hand Layout

Figure 4-16. Holding Circuit Switches (Mid-Stroke Position)

If the points are forced open, e.g., during a trailing move, the clutch housing will rotate so that either Switch SL or SR changes from the actuated position to its open position (refer to Section 3.3.2). This energizes the gear motor. The direction of rotation of the gear motor depends on the position of the clutch housing. If the clutch housing rotates less than half way, Switch S2 will remain actuated. Therefore, the gear motor will rotate to drive the switch points back to their original position.

If the rotation of the clutch housing reaches the halfway point, the roller of Switch S2 rides down from the S2 cam, and Switch S2 is returned to its open position. At the exact halfway point, both switches are in their open positions, as shown Figure 4-16. This prevents the holding circuit from energizing both contactors at the same time.

As the clutch housing rotates past the halfway point, the roller of Switch S1 rides up on the S1 cam and the actuator presses against the switch button, as shown Figure 4-17. Thus, Switch S1 is actuated, and the gear motor will reverse and rotate in a direction to throw the switch points to the opposite position.

4.5. Hand Crank Operation

Operation of the YM-2000 without electrical power may be accomplished by applying a hand crank to the motor armature shaft extension (Figure 4-17 and Figure 4-18). A hand crank and brake release stud are stored inside the hinged compartment located on the side of the YM-2000 housing. This housing also covers the diamond-shaped access cover. The hand crank procedure is as follows:

1. Unlock and open the small side compartment opposite the cranking shaft side of the switch machine.

2. Remove the hand crank from its retainer clips.

3. Remove the brake release stud from the inside of the crank **(**Figure 4–19**)**. Insert the release stud into the opposite end of the crank **(**Figure 4–20**)**.

4. Lift the diamond-shaped, spring-loaded access cover to gain access to the brake release switch and the motor shaft extension. Lifting the cover actuates a switch that disconnects the field wiring from the switch machine, thus preventing remote power application during hand crank operation. The switch should deactuate prior to inserting the hand crank and not actuate again before the cover is fully against its stop.

5. Use the hand crank/release stud **(**Figure 4–20**)** to turn the brake release switch to the "BRAKE RELEASED" position.

6. Remove the release stud from the end of the hand crank and temporarily store it in the crank box.

7. Insert the hand crank onto the motor armature shaft extension.

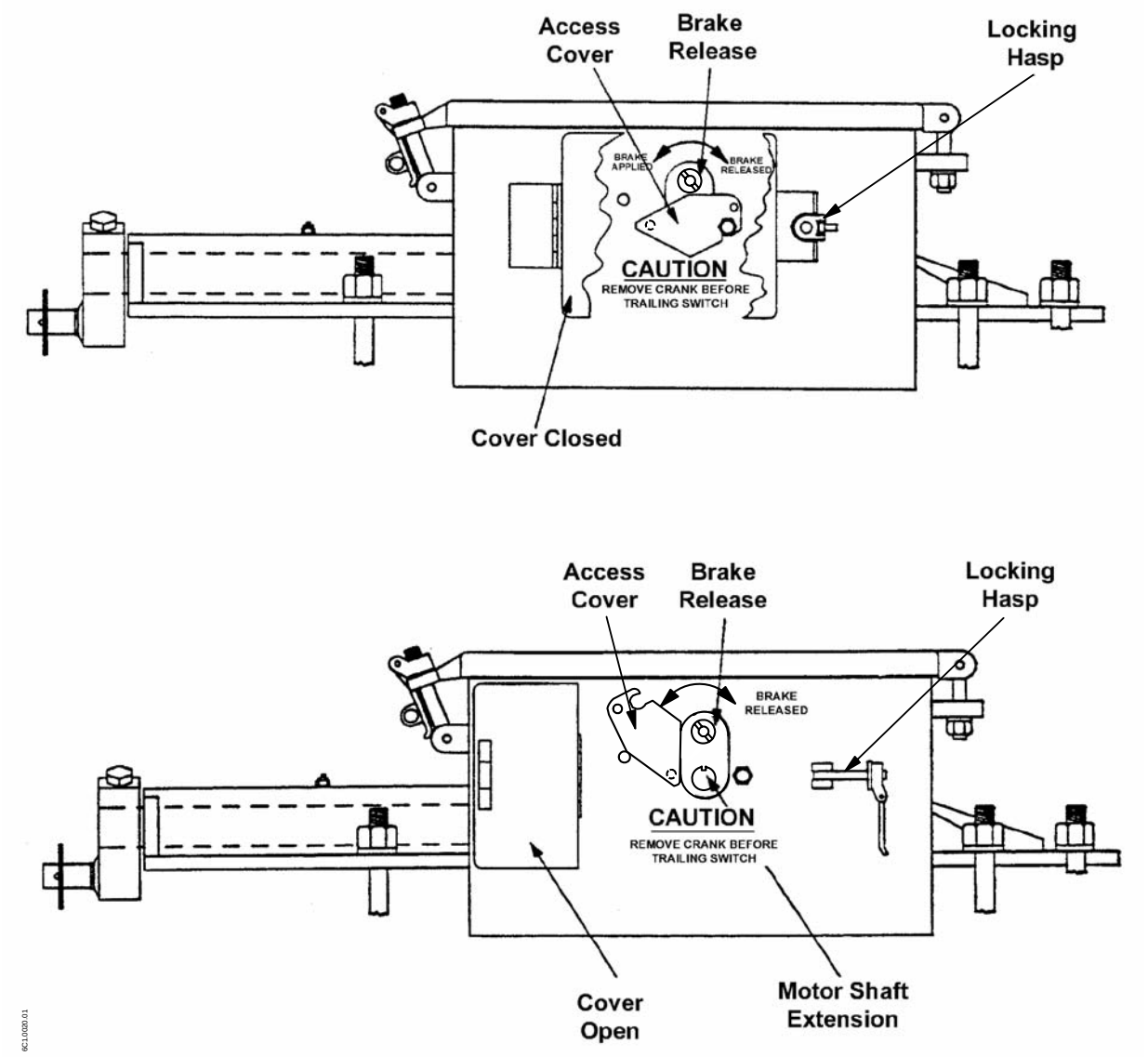


Figure 4-17. Hand Crank Components (Right Hand Switch)

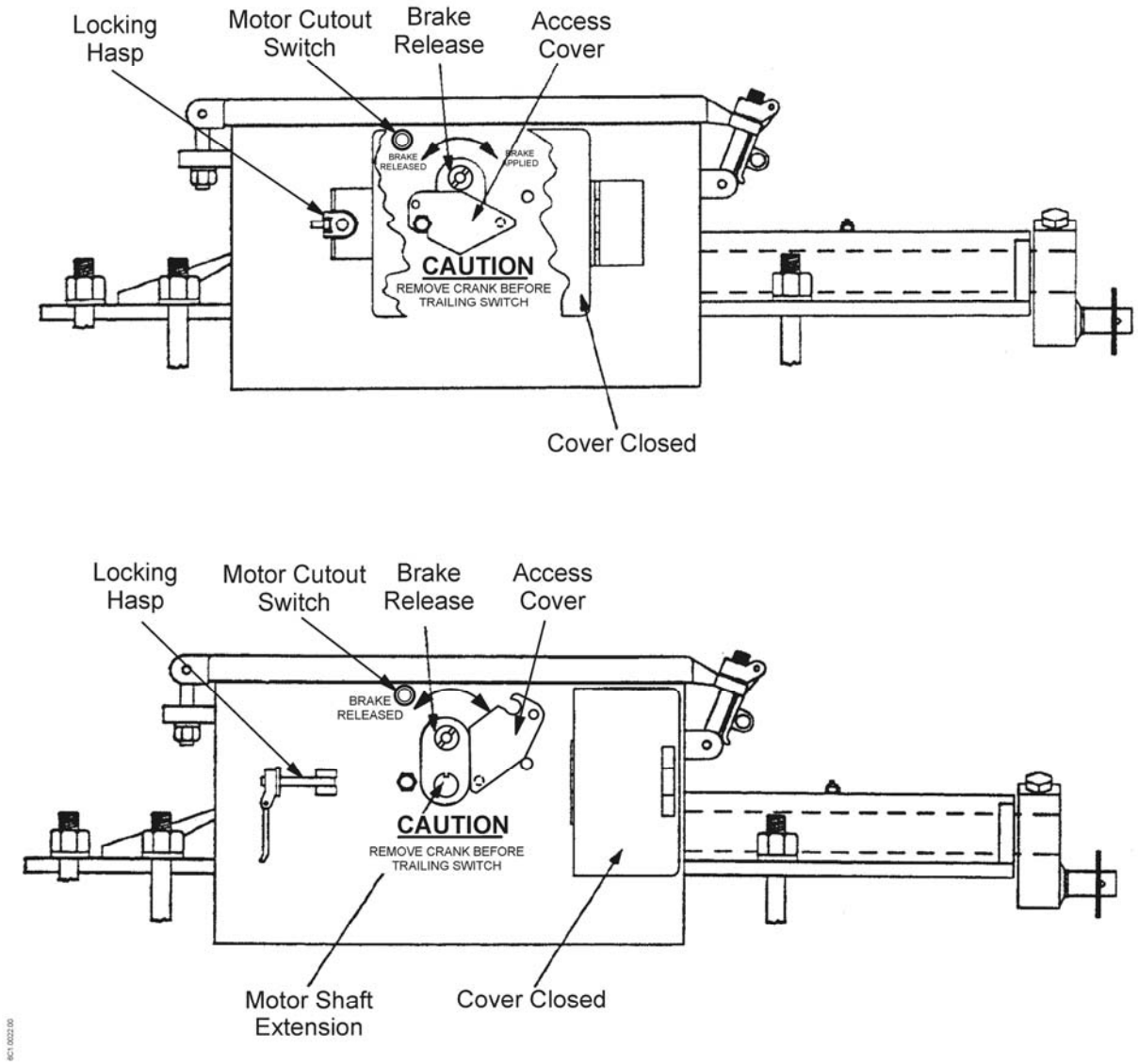


Figure 4-18. Hand Crank Components (Left Hand Switch)

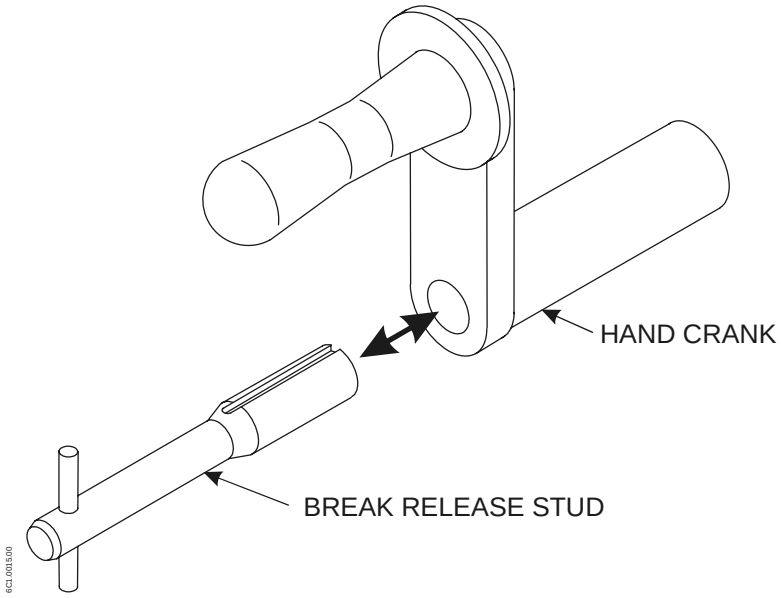


Figure 4–19. Brake Release Stud Storage in Hand Crank

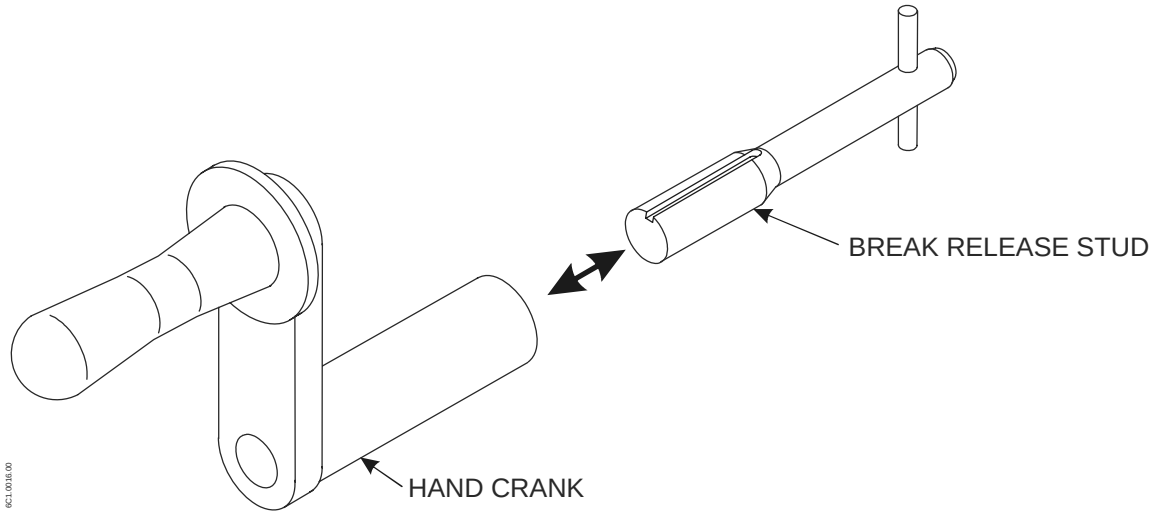


Figure 4–20. Using the Brake Release Stud with the Hand Crank

8. Crank the switch points to the desired position. Lift and hold the access cover, remove the hand crank, and use it to turn the brake release switch to the "BRAKE APPLIED" position.

9. Reinsert the hand crank onto the motor armature shaft extension and release the access cover. (Power remains disconnected from the machine as long as the hand crank remains inserted.)

WARNING

When the access cover is closed, the switch is energized and has the potential to move. Any time the hand crank is removed from the cranking position and the access cover is allowed to close, power is reconnected to the switch machine and it will return to its last called position. Failure to keep the switch clear could result in personal injury or damage to the equipment if caught in the moving switch.

10. After completion of the entire operation, remove the hand crank. Insert the release stud into the original position inside the hand crank. Place the hand crank (with the release stud) in its retainer clips located on the inside of the hinged compartment cover.

CAUTION

If the brake release switch is inadvertently left in the released position, it will be spring-driven to the applied position after the next application of electrical power to the switch machine. However, until power is applied, the switch machine brake is inactive.

11. Close and lock the hinged compartment cover.

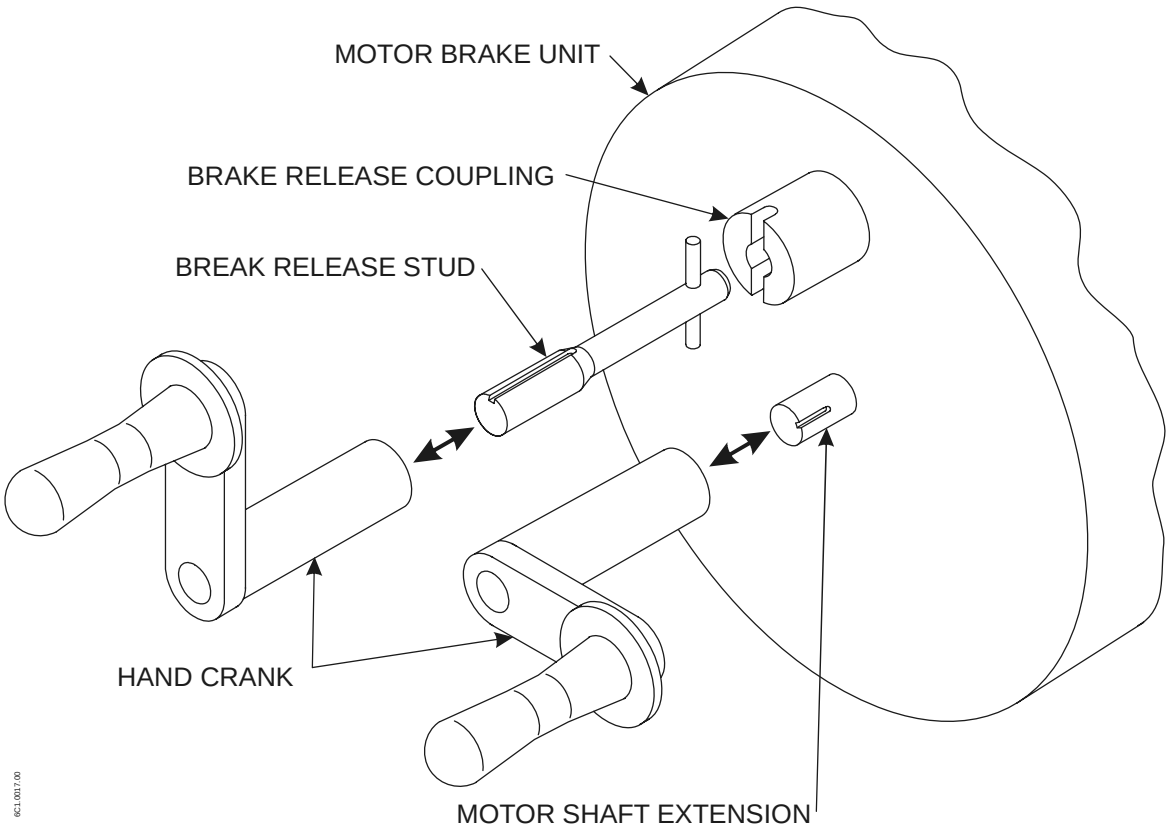


Figure 4–21. Releasing/Applying the Motor Brake and Hand-Crank Operation

4.6. Motor Protection

4.6.1. Current Overload

The YM2000 has a current overload module to protect the motor in the event the points do not close. The current overload module will deenergize the motor when the heater element on the module reaches a preset temperature. When the current overload module drops to a preset lower temperature, it will reenergize the motor to close the points.

The module is set to operate automatically when the YM-2000 Switch Machine is manufactured. If manual reset mode is desired because of a specific location or situation, the current overload module may be set for manual operation by placing the Manual/Automatic Reset Mode Selector in the manual position. In manual mode, the Current Overload Module must be reset manually each time the switch deenergizes the motor.

The Current Overload Module may be set to manual or automatic as follows:

1. Open the cover on the switch machine to gain access to the Current Overload Module (Figure 4-22).

2. Using a flat end screwdriver, engage the notch in the Manual/Automatic Mode Selector and position the selector bar to the desired position (Figure 4-23). For manual mode the bar should be pulled out; for automatic mode, the bar should be pushed in.

3. In manual mode, the switch may be reset by depressing the Manual Reset Button (green) (Figure 4-23) on the front of the Current Overload Module.

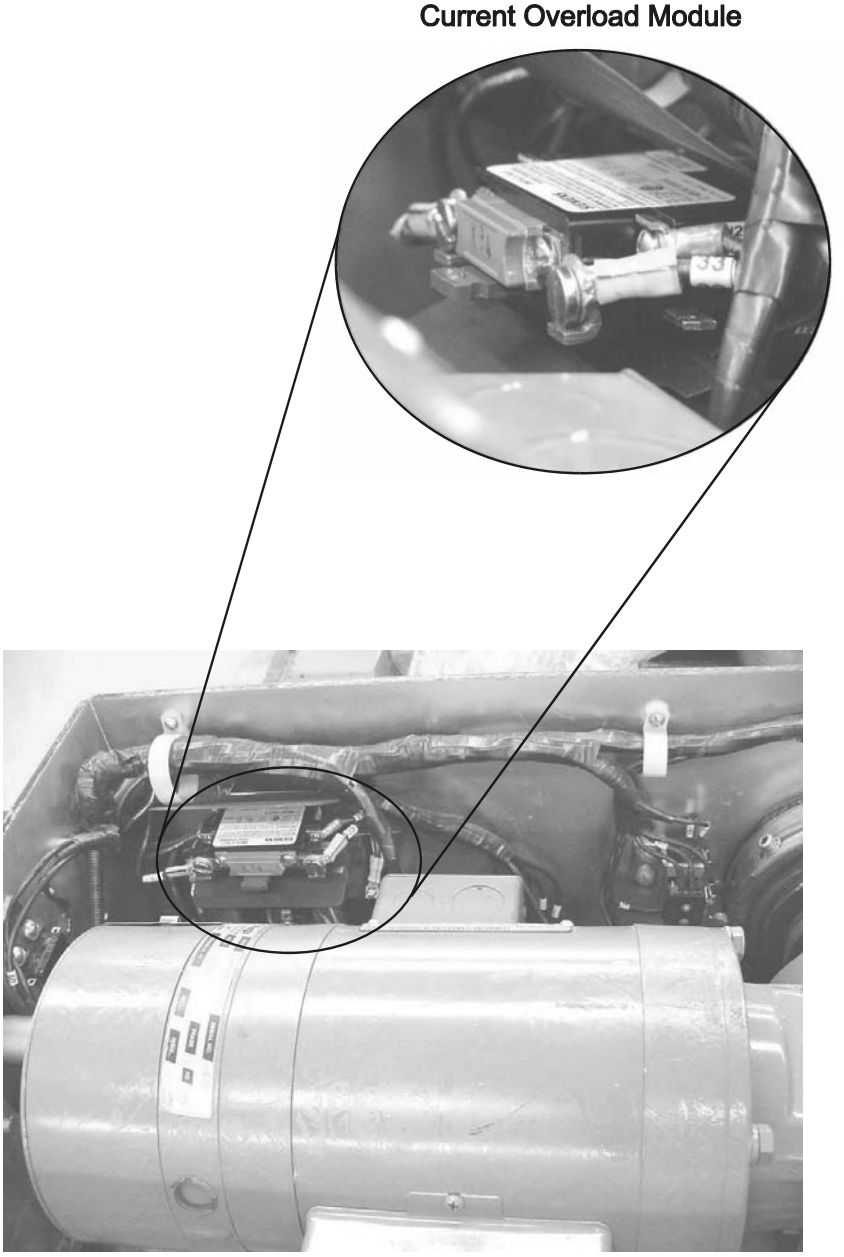


Figure 4-22. Location of Current Overload Module

4.6.2. Thermal Overload

The motor is equipped with an internal thermal overload switch to protect the motor. When the thermal overload switch reaches a preset temperature it will open and deenergize the motor. When the motor cools to a preset lower temperature, the switch will close and energize the motor. This switch is internal to the motor; no adjustments can be made.

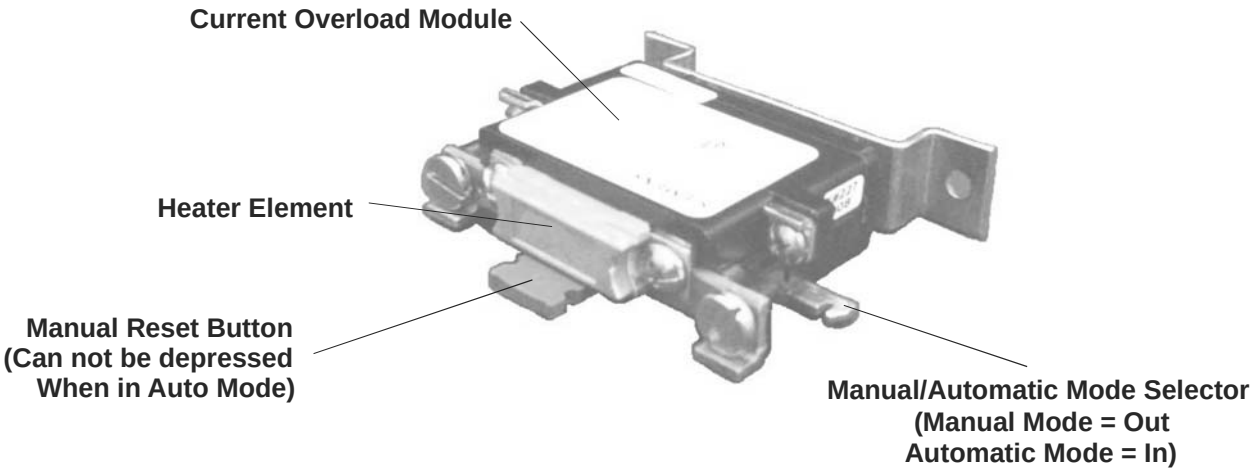


Figure 4-23. Manual Reset Button and Mode Selector on the Current Overload Module

5. MAINTENANCE AND TEST PROCEDURES

This section contains procedures for preventive maintenance, corrective field maintenance, and shop maintenance for the YM-2000™ Switch Machine.

5.1. Preventive Maintenance Schedule

The suggested preventive maintenance schedule is presented in Table 5-1.

Table 5-1. Preventive Maintenance Schedule

Component	Frequency	Maintenance
Operating Crank and Shaft	Every Three Months	Lubricate With Grease (Refer to Section 5.3.1.2)
Entire Switch Machine	Every Six Months	General Cleaning of Components (Refer to Section 5.2.1) Check Operation and Integrity of Components (Refer to Section 5.2.2)
Gear Motor Brake	Once Per Year	Check for Wear of Friction Disc (Refer to Section 5.4.4)
Switch-Operating Rod	Once Per Year	Check Operation and Adjustment (Refer to Section 3.5)
Motor Limit Switch Cams	Once Per Year	Check Operation and Adjustment (Refer to Section 5.4.1)
Holding Circuit Cams	Once Per Year	Check Operation and Adjustment (Refer to Section 5.4.2)
Clutch	Once Per Year	Check Operation and Adjustment (Refer to Section 5.4.3)

5.2. Preventative Maintenance Activities

Sections 5.2.1 and 5.2.2 outline procedures for periodic cleaning and inspection of the YM-2000™ Switch Machine. These procedures must be performed at least once every six months to maximize continuous trouble-free operation.

WARNING

These procedures should be performed under the supervision of or by a person familiar with the potential electrical hazards involved with this operation. Failure to observe this warning could result in personal injury and/or equipment damage.

5.2.1. Cleaning

The YM2000™ should be cleaned periodically to ensure it is free of debris and foreign material and that it is in proper operating condition. It is imperative that it is cleaned at the time of inspection (once every six months). Cleaning prevents excessive wear and corrosion. It also helps prevent electrical components from becoming pitted or possibly shorted because of excessive filtration of sand and/or dust. Clean the YM-2000™ as outlined in Sections 5.2.1.1 and 5.2.1.2.

5.2.1.1. Recommended Cleaning Equipment and Materials (or equivalent)

Device / Material	Specifications
Degreaser	Alcohol-based cleaning agent
Cloths	Lint-free

5.2.1.2. Procedure

WARNING

Disconnect power from the machine before cleaning. Failure to do this could allow the motor to start at any time and could cause personal injury.

1. Disconnect the power supply to the switch machine at the switch junction box.
2. Dampen a lint-free cloth with degreaser.
3. Wipe the YM-2000™ components free of any accumulated dust and dirt. Pay particular attention to ventilators, contactors, terminals and moving parts, e.g., switches.
4. Dry the YM-2000™ components with a clean lint-free cloth.
5. Reconnect the power to the switch machine at the junction box.

5.2.2. Inspection

In general, inspection consists of observing the appearance and integrity of the YM-2000™ components, the associated electrical conduit and the switch-operating rod. A judgment is then made as to whether the YM-2000™ appears to be in good condition, or whether a potential or

obvious faulty condition exists. When any faulty condition is observed, it is to be corrected immediately. Inspection should be performed following the cleaning, i.e., once every six months.

WARNING

Disconnect power from the machine before making these inspections. Failure to do this could allow the motor to start at any time and could cause personal injury.

1. Disconnect the power supply to the switch machine at the switch junction box.

2. Check the YM-2000™ internal components for any sign of pitting, corrosion or general deterioration. Any such equipment must be replaced.

3. Check for loose or damaged electrical connections. Repair or replace as necessary.

4. Check for burned, frayed, or broken insulation. Repair or replace as necessary.

NOTE

Due to separation of the lubricant installed at the factory, a small amount of the lubricant may exit the gearbox assembly. The gearbox is supplied with a permanent gear lubricant and no damage will occur due to this condition.

5. Check for signs of oil leaking from the gearbox. Remove excess lubricant leakage (if found) from the bottom of the machine and continue normal operations. Note the amount of the leakage observed for reference on the next inspection. No other actions are necessary.

CAUTION

Step 6 should be performed prior to anticipated freezing weather in addition to every 6 months. If not, water trapped inside the YM-2000™ housing could freeze and cause faulty operation.

6. Check that there are no signs of water accumulation within the YM-2000™ Switch Machine housing. If water is present, remove the ½-inch drain plug to allow the water to drain out of the compartment. After the compartment is drained, reinstall the drain plug.

7. Check the YM-2000™ Switch Machine cover gaskets for resiliency and signs of wear. The gaskets should form a tight seal when the hinged cover is closed, i.e., the hinged cover should not be loose. Replace worn gaskets.

8. Check that the conduit to the YM-2000™ is not crimped, nicked, cut or otherwise damaged. Repair or replace as necessary.

9. Reconnect the power to the switch machine at the junction box.
10. Operate the YM-2000™ crank back and forth as often as necessary and check for the following:

a. Proper movement of YM-2000™ Switch Machine operating crank.
b. Excessive or unusual vibration and noise.
c. Excessive wear or lost motion.

11. Check the cut-out switch to ensure that power is disconnected from the switch machine when the hand crank is inserted for manual operation. Ensure that all soldered connections are protected with shrink tubing.

5.3. Lubrication

5.3.1. Gear Motor

5.3.1.1. Checking the Grease in the Gearbox

The gearbox is filled at the factory with Mobilith SHC 007 grease. Because this is a lifetime lubricant, replacing this grease should not be necessary.

5.3.1.2. Operating Crank and Shaft

Two grease fittings are provided and require lubrication (approximately three strokes of a grease gun) every three months with specification M7651-2 grease. One grease fitting is located where the operating rod connects to the crank. The other, which lubricates the crank shaft bearings, is located on top of the housing that protects the crank shaft.

5.3.2. Oiling Other Components

Use an oil can to apply a few drops of SAE-30 oil to the cover hinges, hasp pin, and threads.

5.4. Adjustments

5.4.1. Motor Limit Switch Cam Adjustment

An adjustable cam, located on the clutch housing, operates the motor limit switches SR and SL. This cam must be adjusted to account for motor drift following the disconnection of the power supply to the gear motor via the contactor.

WARNING

Disconnect power from the machine before making these adjustments. Failure to do this could allow the motor to start at any time and could cause personal injury.

1. Disconnect the power supply to the switch machine at the switch junction box.

2. Ensure that SR and SL switches are mounted so that the switch buttons are actuated when contacting the corresponding cam. If the switches are positioned too closely to the cams, the metal actuator bar may damage the body of the switch when the roller is on the high point of the cam.

3. Hand crank the motor until the switch machine is in either its full normal or full reverse position.

4. Turn the hand crank two full turns to back the crank away from its fully thrown position.

5. Adjust the cam until the switch (SR or SL) is actuated (clicks). This provides a coarse adjustment of the cam.

6. Hand crank the motor so that the switch points move away from the rails. Continue to hand crank the YM-2000™ until the switch actuator returns to normal position, i.e., the actuator no longer depresses the switch button.

7. Hand crank the motor so that the switch points move back to their end position, i.e., the position they were in at the beginning of Step 3. Turn the hand crank slowly, listening for the click of the limit switch.

8. When the limit switch is actuated (clicks), mark the position of the hand crank.

9. Continue to turn the hand crank in the same direction. The clutch should slip after 1-½ to 2 revolutions of the hand crank from the marked position.

10. If the click occurs in less than 1-½ revolutions before the clutch slips, adjust the cam by sliding it towards the roller of the limit switch.

11. If the click occurs with more than two revolutions before the clutch slips, adjust the cam by sliding it away from the roller of the limit switch.

12. Repeat Steps 5 through 8 to verify the cam adjustment.

13. Repeat the entire procedure for the opposite limit switch.

14. Reconnect the power to the switch machine at the junction box.

5.4.2. Holding Circuit Cam Adjustment

Device / Material	Specifications
Indicator Light	With Battery Supply
Jumper Wire	Length as needed.

Prior to starting any of the following procedures disconnect the power supply to the switch machine at the switch junction box.

WARNING

Disconnect power from the machine before making these adjustments. Failure to do this could allow the motor to start at any time and could cause personal injury.

5.4.2.1. Checking for the Shift Between the Holding Circuit Cams

Holding circuit Switches S1 and S2 are actuated by adjustable cams located on the clutch housing. To check that this adjustment is correct, refer to the following procedure:

1. Hand crank the motor so that the cam that operates Switch S1 is accessible.
2. Loosen the two screws holding the cam to the clutch housing.
3. Position the cam in the middle of the adjustment slot.
4. Tighten the two screws holding the cam to the clutch housing.
5. Jumper terminals 2 and 4 on the motor terminal block.
6. Connect an indicator light, with battery supply, across terminals 4 and 10 of the motor terminal block. The light should be on.
7. Hand crank the motor in the opposite direction until the indicator light goes out. The operating crank should be in its mid-position.

CAUTION

.The indicator light must go out. At no point should both Switches S1 and S2 be actuated.

8. Continue to turn the hand crank in the same direction. The movement of the hand crank must not exceed **45 degrees** before the indicator light comes back on.
9. If necessary, adjust the cam that operates Switch S2 so that the light does not remain out for greater than **45 degrees** rotation of the hand crank.

5.4.2.2. Checking for Holding Circuit Shift at Mid-Position

The operating crank should be in its mid-position when the holding circuit shift occurs. To check that this adjustment is correct, refer to the following procedure:

1. Hand crank the YM-2000™ Switch Machine full stroke and count the number of turns of the hand crank. Divide the total number of turns in half to determine the mid-position.

2. Jumper terminals 2 and 4 on the motor terminal block.

3. Connect an indicator light, with battery supply, across terminals 4 and 10 on the motor terminal block. The light should be off.

4. Hand crank the motor so that the operating crank moves towards its mid-position.

5. When the holding circuit switch, S1 or S2, is actuated, the indicator light will come on.

CAUTION

The indicator light must light. At no point should both Switches S1 and S2 be actuated.

6. Continue to hand crank the motor until the indicator light goes out. This indicates that the holding circuit is shifting. The holding circuit shift should occur when the operating crank is within a 90º turn of the hand crank from mid-position.

7. If the holding circuit shift does not occur at mid-position of the operating crank, adjust the cams so that the shift occurs at the correct position.

8. When the cams have all been properly adjusted, reconnect the power to the switch machine.

5.4.3. Clutch Adjustments

The clutch may be adjusted by using one of the three different procedures provided: (1) Motor Current Draw, (2) Crank Arm Output Torque, or (3) Motor Shaft Input Torque. The procedure used will depend on prevailing conditions, to what the user is most accustomed, and to what proves to be the most satisfactory for his needs.

WARNING

Disconnect power from the machine before making these adjustments. Failure to do this could allow the motor to start at any time and could cause personal injury.

5.4.3.1. Clutch Adjustment by Motor Current Draw

Device/Material*	Specifications
AC Ammeter	Capable of handling 42 ampere inrush current
Obstruction	Size ½"
Jumper Wire	Length as needed.

*To be ordered separately.

The torque wrench method of adjusting the slip clutch is preferred; however, an alternate method using a motor current draw of 9.0-10.0 amperes under clutch-slipping conditions may be substituted. Proceed as follows:

1. Place the obstruction between the switch points and the stock rail to make the clutch slip.

2. Open BX115 test link at Switch JB Figure 3-6).

3. Connect ammeter leads across BX115 test link.

4. Connect a jumper wire between terminal 11 and terminal 1 of the main terminal block. The operating crank will rotate in a clockwise direction when viewed from the operating crank side of the box. If counterclockwise rotation is desired, the jumper should be connected between terminals 11 and 3 of the main terminal block.

5. Reconnect power to the motor; the clutch will now slip. As the clutch is slipping, note the ammeter reading. The motor current should be in the range of 9.0 to 10.0 amperes at 115 volts.

6. If the current is less than 9.0 amperes, disconnect power from the motor and readjust the clutch by tightening the three adjusting bolts. Reconnect power to the motor and repeat the test until the proper current reading is obtained.

7. If the current is greater than 10.0 amperes, disconnect power from the motor and readjust the clutch by loosening the three adjusting bolts. Reconnect power to the motor and repeat the test until the proper current reading is obtained.

5.4.3.2. Clutch Adjustment by Crank Arm Output Torque

Device / Material*	Specifications
Torque Wrench Adapter	ASTS USA Part Number N451596-0201
Torque Wrench	350 foot-pound capacity, 3/4" Square Drive, Snap-On® #TE-352 or Equivalent
Socket	1-¼" 12-Point Socket, ¾" Square Drive

*To be ordered separately.

1. Roughly adjust the clutch by tightening the three adjusting bolts on the torque clutch assembly. Do not over-tighten the three bolts, as this may result in mechanical damage to the gearbox during the torque test.

2. Apply power and allow the clutch to slip for approximately one minute in each direction (clockwise and counterclockwise).

3. Disconnect the power.

4. Using the hand crank, bring the crank arm to mid-position.

5. Attach a torque wrench adapter (Part No. N451596-0201) to the crank arm and tighten the retaining bolt.

6. Attach a torque wrench (350 foot-pound capacity) to the crank arm adapter so that the arm of the torque wrench will be against a stop. (The torque wrench should be approximately in a horizontal position.)

7. Make certain there is no torque on the crank by reversing the hand crank.

8. Zero the dial of the torque wrench.

9. Remove the hand crank and ensure that the access cover is closed. Apply power to the motor, being careful to energize it in such a direction that the gear motor output shaft rotation will be resisted by the torque wrench. As the clutch is slipping note the reading on the torque wrench dial. This should be 200 +/- 20 foot-pounds.

WARNING

If resistance is not encountered, the handle of the torque wrench may kick back and personal injury may result.

10. If the reading is low, disconnect power from the motor and readjust the clutch by tightening the three adjusting bolts. Reconnect power to the motor and repeat the test until the proper torque reading is obtained.

11. If the reading is high, disconnect power from the motor and readjust the clutch by loosening the three adjusting bolts. Reconnect power to the motor and repeat the test until the proper torque reading is obtained.

12. Disconnect the power from the motor.

13. Reposition the torque wrench on the adapter with the handle pointing in the opposite direction and against a stop.

14. Make certain there is no torque on the crank by reversing the hand crank.

15. Zero the dial of the torque wrench.

16. Remove the hand crank and ensure that the access cover is closed. Reconnect power and repeat Steps 9, 10, and 11, except the crank arm should rotate in the opposite direction.

Remove the torque wrench and adapter.

5.4.3.3. Clutch Adjustment by Motor Shaft Input Torque

Device/Material*	Specifications
Torque Wrench Adapter	ASTS USA Part Number N451596-0201
Motor Shaft Adapter	ASTS USA Part Number N451596-0101
Torque Wrench	75-inch-pound capacity, 1/4" Square Drive, Snap-On® #TE-6A or Equivalent
Adapter	1/4" - 3/8" Square Drive
Socket	1" 12-point socket, 3/8" Square Drive

*To be ordered separately.

1. Roughly adjust the clutch by evenly tightening the three adjusting bolts.

2. Reconnect power and allow the clutch to slip for approximately one minute in each direction (clockwise and counterclockwise).

3. Use the hand crank to bring the crank arm to a mid-position.

4. Attach a torque wrench adapter (Part Number N451596-0201) to the crank arm and tighten the retaining bolt.

5. Block the crank arm in mid-position to resist movement.

6. Open the hand crank hole cover and install the motor shaft adapter (Part Number N451596-0101) on to the motor shaft.

7. Release the motor brake.

8. Attach a torque wrench (75-inch-pound capacity) to the motor shaft adapter.

9. Zero the dial of the torque wrench.

10. Turn the torque wrench in a clockwise direction until the clutch starts to slip. Note the reading on the dial. This should be 38 +/- 5 inch-pounds.

11. If the reading is low, readjust the clutch by evenly tightening the three adjusting bolts and repeat the test until the proper torque reading is obtained.

12. If the reading is high, readjust the clutch by loosening the three adjusting bolts and repeat the test until the proper torque reading is obtained.

13. Repeat Steps 10, 11, and 12 but with the torque wrench being turned in the opposite direction.

14. Remove the torque wrench and adapter.

15. Reset the motor brake.

5.4.4. Brake Lining Wear Adjustment

The gear motor brake is factory adjusted for maximum torque, correct plunger travel, and correct solenoid frame position.

Adjustment is necessary when the ground plunger surface is behind the “reset” level of the label.

1. To check the air gap (Figure 5-3), view the ground plunger surface position directly behind the air gap reset label. To accurately check the air gap, press the solenoid plunger and allow it to snap out several times.

2. The air gap is decreased by turning both adjustment screws (R) equal amounts clockwise in increments of 1/8 turn until the ground plunger surface is at the “set” level of the label. Counterclockwise rotation increases the gap. Repeat Step 1.

3. The air gap can be set to 3/8 inch as alternate to visual method.

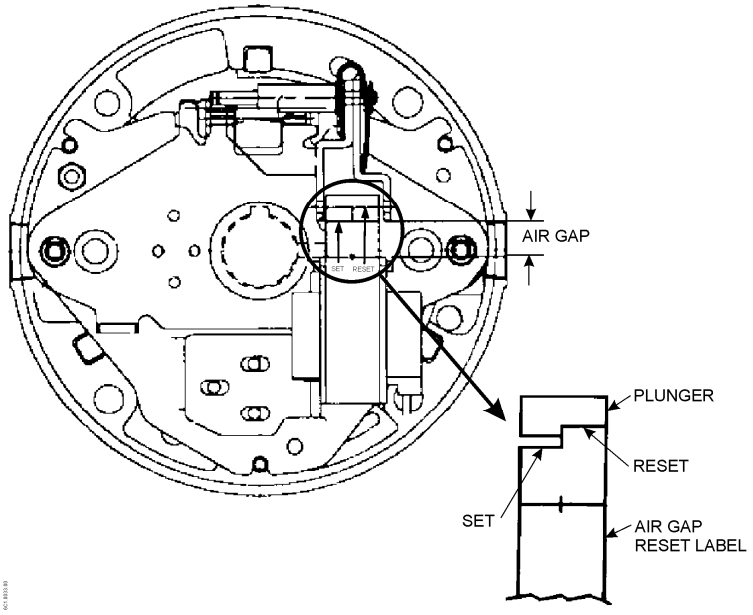


Figure 5-1. Air gap

5.4.5. Friction Disc Replacement

Replacing the friction discs is not recommended. If the friction discs need replaced, remove the motor and return it to Ansaldo ASTS USA to have friction discs replaced.

5.4.6. Solenoid and Associated Component Replacement

Refer to Figure 5-2 and proceed as follows to remove the solenoid:

1. Insert a screwdriver between support plate (X) and lever arm (T). Wedge apart and remove as an assembly: bearing pin (U), bearing (M), pin (Y), solenoid lever (N) connected to solenoid link and plunger.

2. On coil type (12A) remove plunger guide screws. Remove both plunger guides (82) by prying up on the flanges. Slide coil (12A) sideways from the frame noting the position of coil terminals or lead wires.

3. On coil type (12B), remove plunger guide (82A) by lifting out of top of solenoid frame. Coil (12B) has a lock tab, located at bottom of coil opposite of the lead wire side which is pressed against coil and coil is slid sideways from solenoid frame.

4. Inspect and clean all items..

5. Reassemble brake in reverse order of Steps 1 and 2.

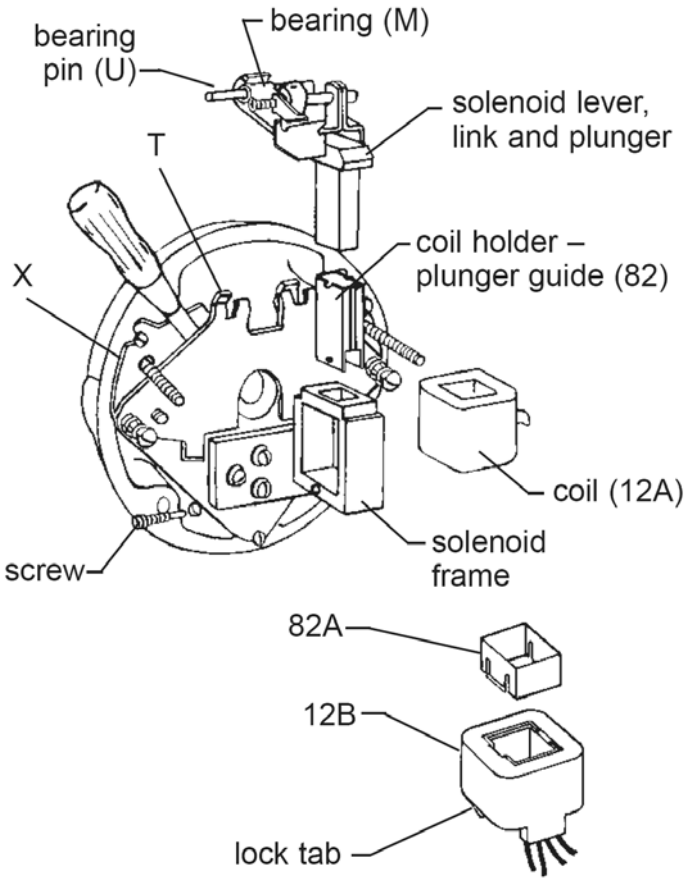


Figure 5-2. Solenoid Components

5.4.7. Brake Troubleshooting

If the brake does not stop properly or overheats, check the following:

1. Check for worn, charred or broken friction discs.

2. Hub may have become loose and shifted on shaft. Recheck set screw torque. Reposition hub if shifted.

3. If hub is clean, make sure friction discs slide freely on hub.

4. Check that stationary discs slide freely in the endplate. Check slots of endplate for wear at the areas where stationary discs are in contact. Grooves in the slots can cause hang-up of ears of stationary discs. If grooving is noted, replace endplate.

5. Check for broken or missing stationary disc separator springs on each of the three stationary disc ears

6. Check for proper solenoid air gap adjustment. See Section 5.4.4 for instructions.

7. Solenoid may not be energizing and releasing the brake. Check voltage at the coil and compare to the coil and/or nameplate voltage rating.

8. A voltage drop may be occurring. If excessive drop in voltage is noted, check the wire size of power source. Replace with larger gauge wire if necessary.

NOTE

A method to check the voltage at the coil is to insert a block of wood of the approximate thickness of the solenoid air gap between the solenoid frame and plunger. (The block will prevent brake from releasing when coil is energized.) Connect the voltmeter leads at the coil terminals or lead wires. Energize the coil. The voltmeter will not fluctuate and a reading can be taken. Reading should be taken immediately and coil deenergized to prevent overheating the coil. Compare the voltage reading with the coil rating.

9. Check the linkage for binding. Press the solenoid plunger down to the frame surface. It should move without binding.

10. Make sure the brake cycle controls operating properly?

11. The brake coil should be energized at same time or prior to energization of the motor, and deenergized at same time or after deenergization of the motor.

12. If the stopping time is more than one second (rule of thumb) and/or application is more than five stops per minute, check thermal requirements of load versus thermal rating of brake.

13. Check that the mounting face is within NEMA tolerances

14. The friction discs need to be replaced when the worn area is one half of original thickness (3/16”). If the friction discs need replaced, remove the motor and return it to Ansaldo ASTS USA to have friction discs replaced.

15. Make sure that the wear adjust screws are of equal height. Measure from the inboard side of the support plate with a depth micrometer. Turn one screw to obtain equal height, reassemble and see Section 5.4.4 for instructions.

5.4.8. Solenoid Troubleshooting

If the solenoid hums, pulls in slowly or if the coil burns out, check the following:

1. Check A-6 through A-11 of this Section.

2. Check for broken or cracked shading coils on the solenoid frame surfaces.

3. The solenoid plunger to frame contact surface may be excessively dented.

4. Check that solenoid plunger to frame contact surfaces are not sticky and dirty.

5. Solenoid mounting screws may have become loose and caused the frame to shift and the plunger to seat improperly.

5.4.9. Motor Cutout Micro-Switch Adjustment Procedure

This adjustment procedure properly positions the motor cutout switch so that it provides protection against inadvertent activation of the motor while the switch machine is being hand-cranked. This minimizes the potential for injury to the person during the hand-cranking operation.

WARNING

Disconnect power from the machine before making these adjustments. Failure to do this could allow the motor to start at any time and could cause personal injury.

NOTE

Please read this entire procedure prior to making any adjustments. Item numbers used in this procedure refer to Figure 5-3 and Figure 5-4.

1. Remove power from the switch machine. The hand crank access cover (Item 1) should be in its horizontal (closed) position, (Figure 5-3) resting on the closed stop pin (Item 5).

2. Ensure that the hand crank access cover pivots freely from its closed position to its open position (Figure 5-4) and the return spring (Item 7) is connected to the spring post of the pivot cam (Item 2) and is working properly.

3. With the access cover in the closed position against the closed stop pin, loosen the two 1/4 - 20 round head screws (Item 3) just enough so that the motor cutout switch bracket assembly (Item 6) can be moved up or down.

4. Move the motor cutout switch bracket assembly downward so the roller (Item 4) strikes the top of the pivot cam until you hear an audible click indicating the switch has been activated.

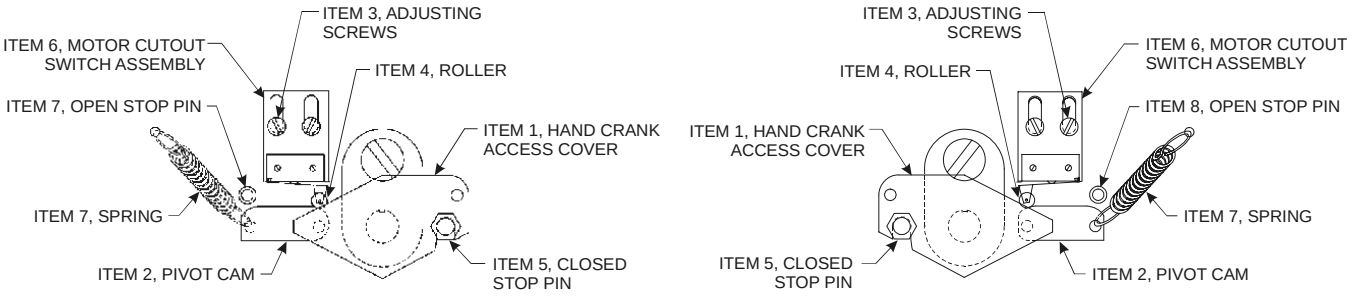
NOTE

When moving the motor cutout switch bracket assembly keep the assembly as vertical as possible.

5. After the audible click has been heard, continue to move the motor cutout switch bracket assembly downward against the pivot cam for an additional 1/32 of an inch to ensure that the roller is tight against the pivot cam. Tighten the two screws securing the assembly in that position.

6. Rotate the hand crank access cover to its open position. During the transition of the hand crank access cover from the closed position to the open position, an audible click should be heard prior to being able to insert the hand crank. This indicates the deactivation of the micro-switch. At this point the cutout switch should provide motor cutout protection. Continue rotating the hand crank access cover to its full open position against the open stop pin.

7. Check the tightness of the roller (Item 4) against the pivot cam (Item 2). The roller should not be tightly held against the pivot cam but only riding on it. Check the free play in the roller. The roller should be free enough to lift at least 0.025" off of the pivot cam (Figure 5-5). Measure this gap with an 0.025" feeler gage. If the gap is at least 0.025" then the motor cutout switch is adjusted properly and no further adjustment is required. However if the gap is not at least 0.025" then repeat Steps 3 through 7 until the measured gap between the roller and the pivot cam is at least 0.025".


ITEM 3, ADJUSTING SCREWS
ITEM 6, MOTOR CUTOUT SWITCH ASSEMBLY
ITEM 4, ROLLER
ITEM 7, OPEN STOP PIN
ITEM 1, HAND CRANK ACCESS COVER
ITEM 7, SPRING
ITEM 2, PIVOT CAM
ITEM 5, CLOSED STOP PIN
ITEM 3, ADJUSTING SCREWS
ITEM 6, MOTOR CUTOUT SWITCH ASSEMBLY
ITEM 4, ROLLER
ITEM 8, OPEN STOP PIN
ITEM 1, HAND CRANK ACCESS COVER
ITEM 7, SPRING
ITEM 5, CLOSED STOP PIN
ITEM 2, PIVOT CAM

Right-Hand Switch Machine (PN N451063-0301, -0303)

Left-Hand Switch Machine (PN N451063-0502)

Figure 5-3. Hand Crank Access Cover in Closed Position (View from Outside the Switch Machine).

5.4.9.1. Verification of Operation

1. Starting with the hand crank access cover (Item 1) in its closed position there should be no play between the roller (Item 4) and the pivot cam (Item 2) – the roller should be tight against the cam.

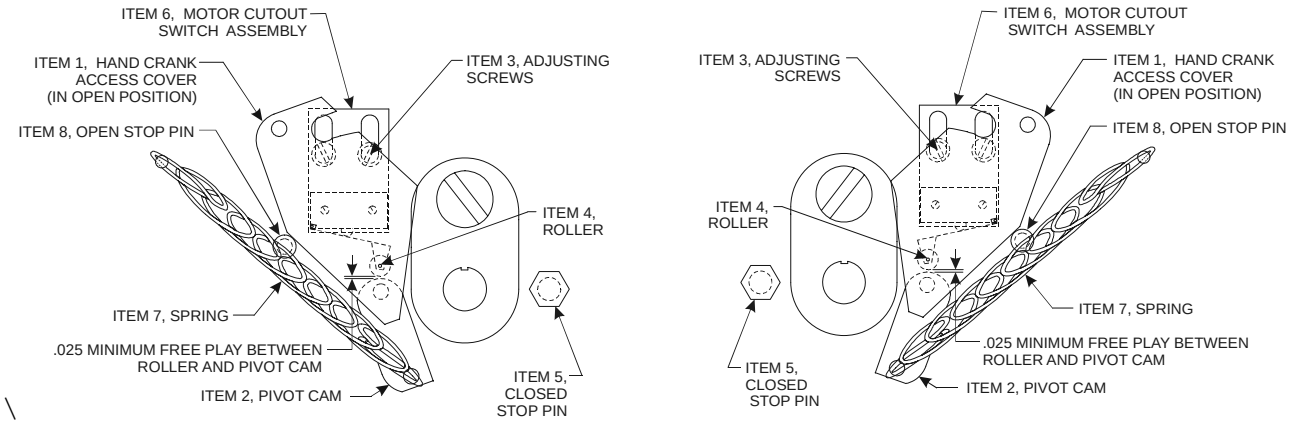
2. Raise the hand crank access cover (Item 1) towards its fully open position. A single click should be heard before the hand crank access cover is open far enough to allow the hand crank to be installed. Continue raising the access cover to its fully open position.

3. Check the play between the roller (Item 4) and the pivot cam (Item 2) with a feeler gage (Figure 5-5). It should be at least 0.025".

4. Slowly return the access cover to its closed position. The switch must operate (audible click) when the access cover is approximately 3/4 closed and before the cover rests on the closed stop pin (Item 5).

5. Open and close the hand crank access cover several times to check that the spring (Item 7) is operating freely. Verify that the hand crank cannot be installed before a click is heard when opening the hand crank access cover.

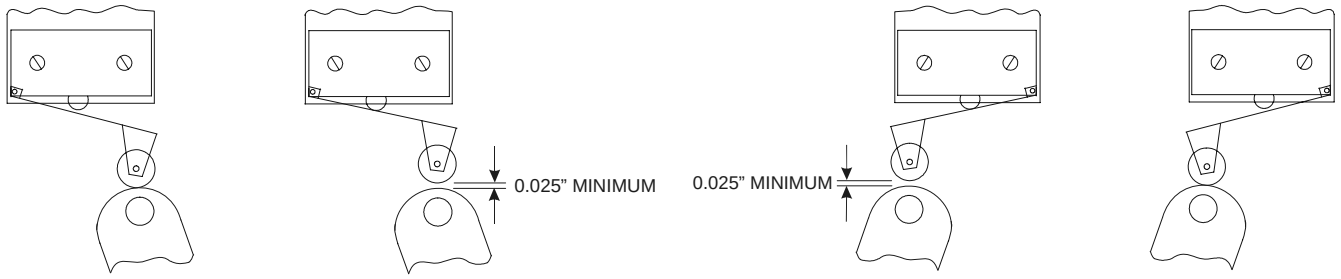
6. Verify that a click is heard when closing the hand crank access cover before the cover is completely closed.


ITEM 6, MOTOR CUTOUT SWITCH ASSEMBLY
ITEM 1, HAND CRANK ACCESS COVER (IN OPEN POSITION)
ITEM 3, ADJUSTING SCREWS
ITEM 8, OPEN STOP PIN
ITEM 4, ROLLER
ITEM 7, SPRING
.025 MINIMUM FREE PLAY BETWEEN ROLLER AND PIVOT CAM
ITEM 2, PIVOT CAM
ITEM 5, CLOSED STOP PIN
ITEM 6, MOTOR CUTOUT SWITCH ASSEMBLY
ITEM 3, ADJUSTING SCREWS
ITEM 1, HAND CRANK ACCESS COVER (IN OPEN POSITION)
ITEM 8, OPEN STOP PIN
ITEM 4, ROLLER
ITEM 7, SPRING
.025 MINIMUM FREE PLAY BETWEEN ROLLER AND PIVOT CAM
ITEM 5, CLOSED STOP PIN
ITEM 2, PIVOT CAM

Right-Hand Switch Machine (PN N451063-0301, -0303)

Left-Hand Switch Machine (PN N451063-0502)

Figure 5-4. Hand Crank Access Cover In Open Position (View from Outside the Switch Machine)


0.025" MINIMUM
0.025" MINIMUM
FREE PLAY IN THE ROLLER WHEN THE HAND CRANK ACCESS COVER IS IN THE OPEN POSITION
FREE PLAY IN THE ROLLER WHEN THE HAND CRANK ACCESS COVER IS IN THE OPEN POSITION

Right-Hand Switch Machine (PN N451063-0301, -0303)

Left-Hand Switch Machine (PN N451063-0502)

Figure 5-5. Free Play Between Roller and Pivot Cam (Viewed from Outside the Switch Machine)

5.5. Gear Motor Maintenance

5.5.1. Removal

WARNING

This procedure should be performed under the supervision of, or by, a person familiar with the potential electrical hazards involved with this operation. Failure to observe this warning could result in personal injury and/or equipment damage.

1. Disconnect the power supply to the switch machine at the switch junction box (Figure 3-1).

2. Remove the wires at the terminal block that connect the motor. Be sure to tag each wire before it is removed to aid in rewiring later.

3. Remove the four mounting bolts and lock washers from the base of the gear motor.

4. Slide the gear motor away from the output shaft until the clutch drive plates clear the clutch housing.

WARNING

The gear motor weighs more than 50 pounds and should be lifted by two people. Failure to observe this warning could result in personal injury and/or equipment damage.

5. Lift the gear motor from the switch machine box.

6. Slide the clutch assembly and key off of the gear motor output shaft. A gear puller may be required to remove the clutch assembly.

5.5.2. Installation

1. Ensure that the power supply is disconnected from the switch machine at the switch junction box (Figure 3-1).

2. Place the key in the slot of the output shaft and slide on the clutch assembly.

WARNING

The gear motor weighs more than 50 pounds and should be lifted by two people. Failure to observe this warning could result in personal injury and/or equipment damage.

3. Set the gear motor into the switch machine box.

4. Connect the tagged wires form the motor to their proper terminals on the terminal block.

5. Align the clutch drive plate assembly with the slots in the clutch housing by applying the hand crank to the motor shaft.

6. Install the four mounting bolts and lock washers in the base of the gear motor. Apply LocTite® Threadlocker 242 to the threads of the mounting bolts prior to installation.

7. Connect the power supply to the machine.

8. Cycle the machine several times and inspect for binding or improper throw due to cam settings.

6. SWITCH MACHINE PARTS LIST

Refer to Figure 6-1 and Figure 6-2 for R.H. switch machine item numbers.

Refer to Figure 6-3 and Figure 6-4 for L.H. switch machine item numbers.

NOTE

Effective September 2008, the motor-gear assembly previously used for the YM2000 switch machines (Part No. N451064-1401) is no longer available. If this unit needs service, ASTS USA recommends that the entire switch machine be returned to our Batesburg facility for installation of the current design unit. (Refer to Section 7 for contact information).

Table 6–1. Basic Switch Machine Configuration

ASTS USA Part Number	Motor-Gear Right Angle Assembly	Contactor	Harness
N451063-0301	See Item 16	J706448	N451064-2202
N451063-0303	See Item 16	J706448	N451064-2101
N451063-0502	See Item 16	J706448	N42000601

NOTE

The parts listed below are used on all models of the YM-2000™ Electric Switch Machine except as indicated in the list.

ITEM NO.	DESCRIPTION	ASTS USA PART NUMBER
1	Box (Complete)	
	• Model No. N451063-0301, -0303	N451064-1704
	• Model No. N451063-0502	N420003-02
2	Cover (Complete)	N432247-002
3	Bolt, Eye	M064973
4	Rod	M432249
5	Hasp	N072832
6	Stud, Hasp	M387732
7	Washer	M391200
8	Bracket, Left-Hand	M392742

ITEM NO.	DESCRIPTION	ASTS USA PART NUMBER
9	Bracket, Right-Hand	M392743
10	Tag, Name-Plate ASTS USA	J451665-1901
11	Switch, Licon Type	J725306
12	Switch, Mini Double-Pole Double-Throw	J725274
13	Insulation	M392764
14	Insulation	M392765
15	Shaft	N392750
16	Motor, with Brake	--
	Machines Manufactured Before June 30, 2010	
	• Model No. N451063-0301, -0303 (115V ac)	J717216-0401
	• Model No. N451063-0502 (115V ac)	N420004-01
	Machines Manufactured After June 30, 2010	--
	• Model No. N451063-0301, -0303 (115V ac)	N420010-01
	• Model No. N451063-0502 (115V ac)	N420010-02
17	Tubing, Shrink	A774169
18	Clutch, Torque-Limiting	N398382
19	Contactor, Reversing (See Note 1)	
	• Model No. N451063-0301, -0502 (115V ac)	J706448
	• Model No. N451063-0303 (115V ac)	J709599
20	Block, 12-Way Terminal	J077653
21	Block, 6-Way Terminal	M107203
22	Nut, #14-24 Hex Brass	J480301
23	Nut, #14-24 Hex Brass	J480300
24	Washer, 17/64” X 9/16w Copper	J047818
25	Ventilator	
	• Model No. N451063-0301, -0303	PN070109
	• Model No. N451063-0502	N070109
26	Plug, Pipe 1/2” Cast Iron	J032903
27	Plug, Pipe 1-1 /2” Cast Iron (Used on Model No. N451063-0502)	J032992
28	Connector, 1-1/2” Sealtite	J323152
29	Nut, Lock 1-1/2” Conduit	J048417
30	Washer, ¼” Stainless Steel Lock	J047521
31	Washer, #10 Stainless Steel Lock	J475121-0109
32	Screw, 1 /4”-20 X 1/2” Fillister Head	J507300-0108

ITEM NO.	DESCRIPTION	ASTS USA PART NUMBER
33	Washer, 1/4” Shakeproof Lock	J047648
34	Screw, #3-48 X 3/4” Round Head	J500131-0112
35	Pin, Cotter 1/8” X 3/4” Spring Steel	J048618
36	Nut, 1/2”-13 Hex Stainless Steel	J480212-0110
37	Fitting, 1/8” Alemite Lubrication	J039137
38	Bolt, 5/16”-18 X 1-1/2” Hex	J500098-0124
39	Washer, 5/16” Stainless Steel Lock	J475121-0112
40	Screw, 1/4-20 X 7/8 Fillister Head	J500139-0114
41	Arm, Crank	R392799
42	Bolt, 1/2”-13 X 3-1/4” Square	J500135-0126
43	Washer, 1/2” Stainless Steel Lock	J475121-0115
44	Washer, 1” Steel Plate	J047509
45	Pin, Cotter 3/16” X 1-1/4”	J048633
46	Plate, Name	M451064-1901
47	Bolt, 3/8”-16 X 1-1/2” Hex	J507349-0124
48	Pin, Roll, 1/8” X 7/8”	J487025
49	Harness (See Note 2)	--
	• Model No. N451063-0301 • (w/ 115V ac Contactor)	N451064-2202
	• Model No. N451063-0303 (w/ 24V dc Contactor)	N451064-2101
	• Model No. N451063-0502 (w/ 115V ac Contactor)	N420006-01
50	Washer, #8 Shakeproof Lock	J047892
51	Bag, Plastic	J078399
52	Tag, White MKG 1	J075510-0128
53	Tag, White MKG 2	J075510-0154
54	Tag, White MKG 3	J075510-0180
55	Tag, White MKG 4	J075510-0197
56	Tag, White MKG 5	J075510-0214
57	Tag, White MKG 6	J075510-0225
58	Tag, White MKG 7	J075510-0236
59	Tag, White MKG 8	J075510-0245
60	Tag, White MKG 9	J075510-0253
61	Tag, White MKG 10	J075510-0258
62	Tag, White MKG 11	J075510-0263
63	Tag, White MKG 12	J075510-0268

ITEM NO.	DESCRIPTION	ASTS USA PART NUMBER
64	Tag, White MKG 13	J075510-0273
65	Tag, White MKG 14	J075510-0274
66	Tag, White MKG 15	J075510-0275
67	Grommet, Rubber #2861	J751127
68	Clamp, Cable HP-14	J700639
69	Clamp, Cable HP-8	J700590
70	Screw, #10-32 X 3/8” Fillister Head Stainless Steel	J500133-0106
71	Washer, #10 Stainless Steel Plate	J475120-0110
72	Cap, Molded Insulating	J078147
73	Lead	N438431-001
74	Lead	N438431-002
75	Insulation – Micarta	M393926
76	Screw, #10-32 X 7/16” Fillister Head Stainless Steel	J525272-0107
77	Test Link	J071626
78	Plate, 1/8” X 1.25” Steel	M395858
	• Model No. N451063-0301, -0303	M395858
	• Model No. N451063-0502	M393858
79	Cam, 7/16” X 1”	
	• Model No. N451063-0301, -0303	R395907
	• Model No. N451063-0502	R420005-02
80	Screw, #3-48 X 1” Round Head Brass	J516063
81	Terminal, PR Insul	J730053
82	Plate, Cover	
	• Model No. N451063-0301, -0303	R451064-0502
	• Model No. N451063-0502	R420005-04
83	Strip, Terminal	J724351
84	Bolt, Shoulder	M451299-1101
85	Spring, Tension Steel	J680156
86	Label – Vinyl Cloth	J075955-0002
87	Bushing, Oilite (Not used on Model No. N451063-0501)	J792154
88	Pin, Roll 3/32” X 1/2” Stainless Steel	J487088
89	Washer, #3 Shakeproof Lock	J047801
90	Washer	M073099
91	Screw, #8-32 X 1-3/4” Round Head Stainless Steel	J500132-0128
92	Washer, #8 Stainless Steel Lock	J475121-0108

ITEM NO.	DESCRIPTION	ASTS USA PART NUMBER
93	Insulation	M433814
94	Not Used	- -
95	Clip, Adjustable Spring	J562069
96	LocTite® Threadlocker 242	J041245
97	Crank, Hand	N392760
98	Tag, White MKG H2	J075510-0955
99	Pin, Roll 3/32" X 3/4"	J487110
100	Wire	S705.11
101	Heater, 15 Watt	N281772001
102	Separator, 1/4" X 1/2"	M051886
103	Screw, 1/4"-20 X 1-3/4" Round Head	J500134-0114
104	Washer, ¼" Stainless Steel Medium Lock	J475118
105	Tag, White MKG 16	J075510-0276
106	Tag, White MKG 17	J075510-0277
107	Tag, White MKG 18	J075510-0278
108	Element, Heater Overload	J713154-0004
109	Overload Protector (Bi-Metal Relay)	J726153-0016
110	Insulator, Overload Protector	J780059
111	Washer, 5/16" Plate	J4751200113
112	Washer, #6 Shake Proof	J4751210126
114	Screw, 10-32 x ½	J525262
115	Screw, Set 10-32 x ¼	J050499
116	Washer, #10 Shake Proof (Not used on Model No. N451063-0303)	J047942
117	Clamp, Cable HP-18 (Not used on Model No. N451063-0303)	J700934
118	Washer, ¼" Stainless Steel (Used only on Model No. N451063-0502)	J475120-0112

Note 1: Contactor Item 19: To replace contactor on N4510630301 with serial numbers prior to 3298001 (manufacture date 32nd week of 1998), order kit X41900001, which includes contactor, wiring harness, drill template, and hardware.

Note 2: Wiring Harness for N4510630301 only:
Serial number prior to 3298001 – Harness No. N4510641801
Serial number 3298001 to 0700010 – Harness No. N4510642201
Serial number 0800001 and later – Harness No. N4510642202

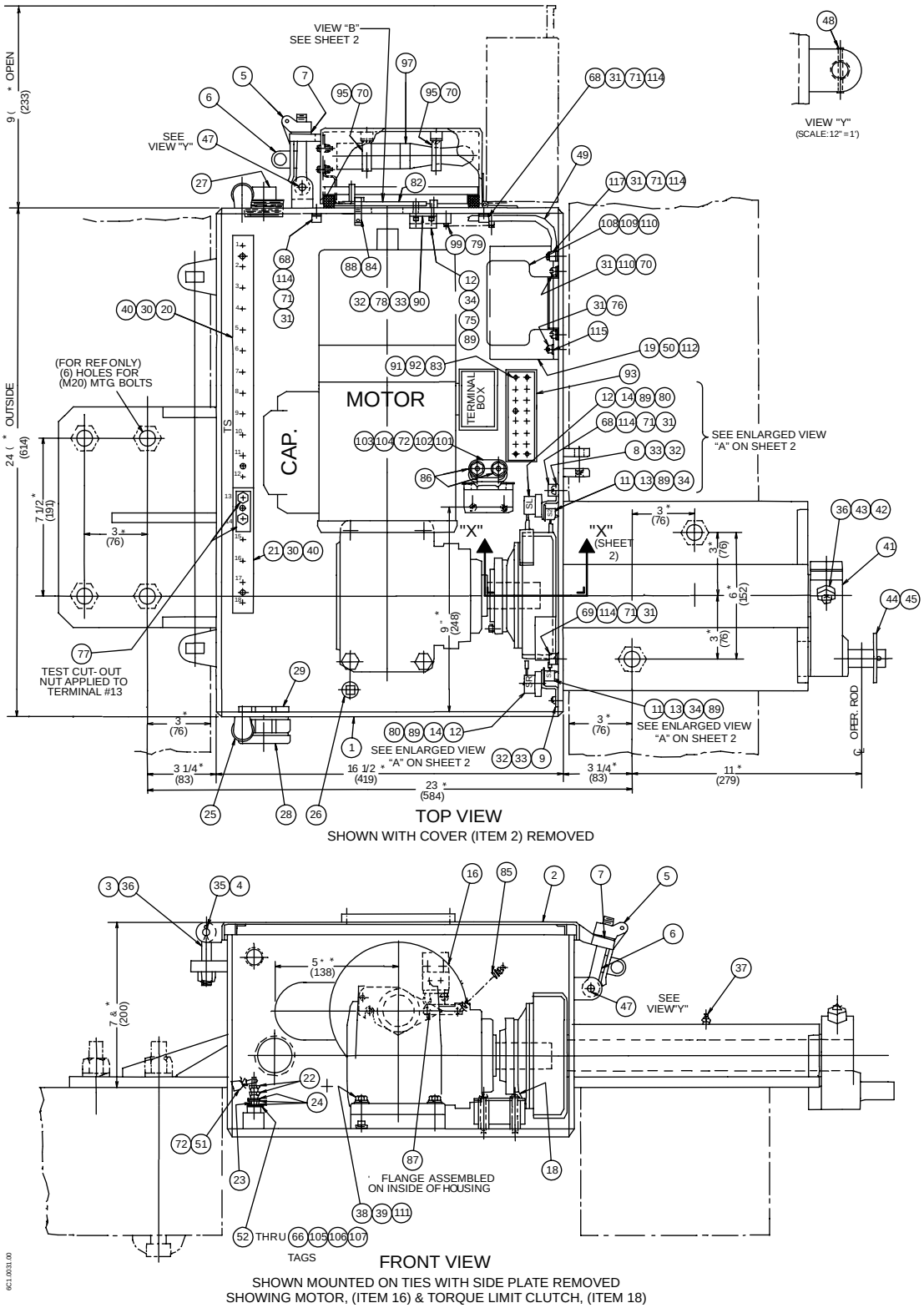
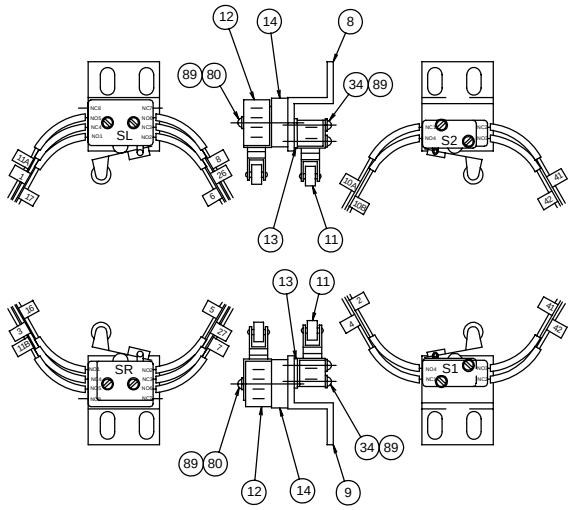
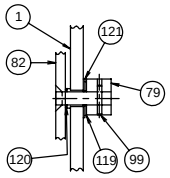


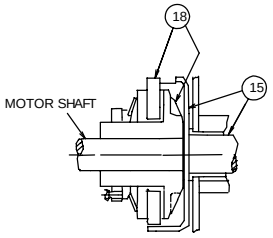
Figure 6-1. YM-2000™ Parts Locations for R.H. Switch Machine (Sheet 1 of 2)



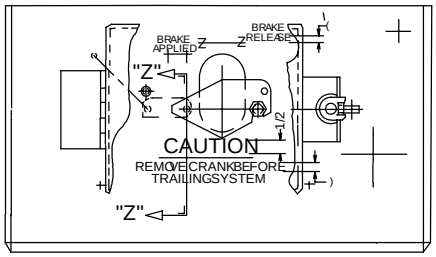
ENLARGED VIEW A
FROM SHEET 1 SHOWING
ASSEMBLY OF SWITCHES TO BRACKETS



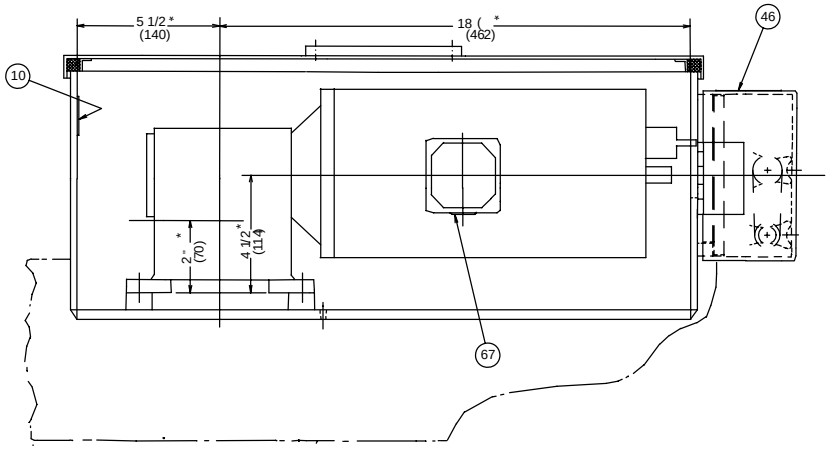
ENLARGED SECTION Z-Z
SHOWING INSTALLATION OF
HAND CRANK COVER PLATE



SECTION X-X
FROM SHEET 1 SHOWING MTG. OF TORQUE LIMITER
CLUTCH, CLUTCH DRIVE PLATE &
DRIVING CUP SHAFT



VIEW B
FROM SHEET 1



SIDE VIEW
SHOWN WITH SIDE PLATE
REMOVED SHOWING MOTOR (ITEM 16)

Figure 6-2. YM-2000™ Parts Locations for R.H. Switch Machine (Sheet 2 of 2)

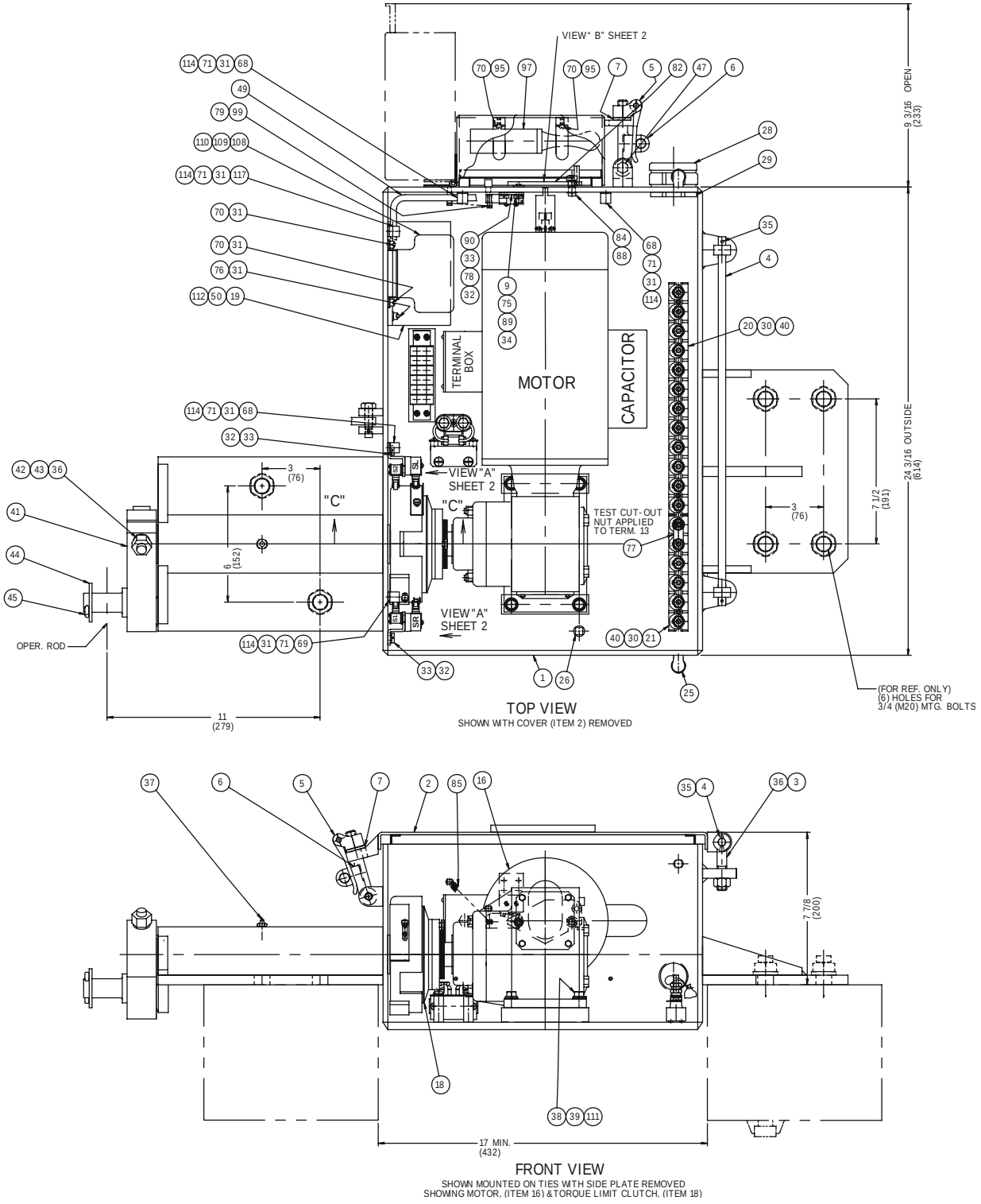
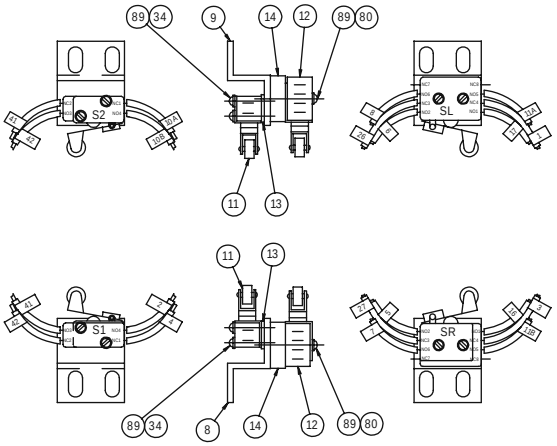
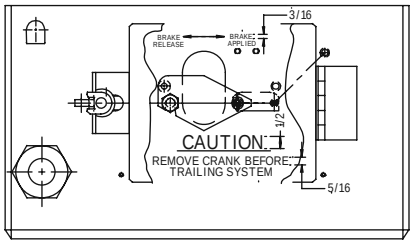


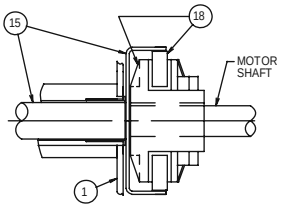
Figure 6-3. YM-2000™ Parts Locations for L.H Switch Machine (Sheet 1 of 2)



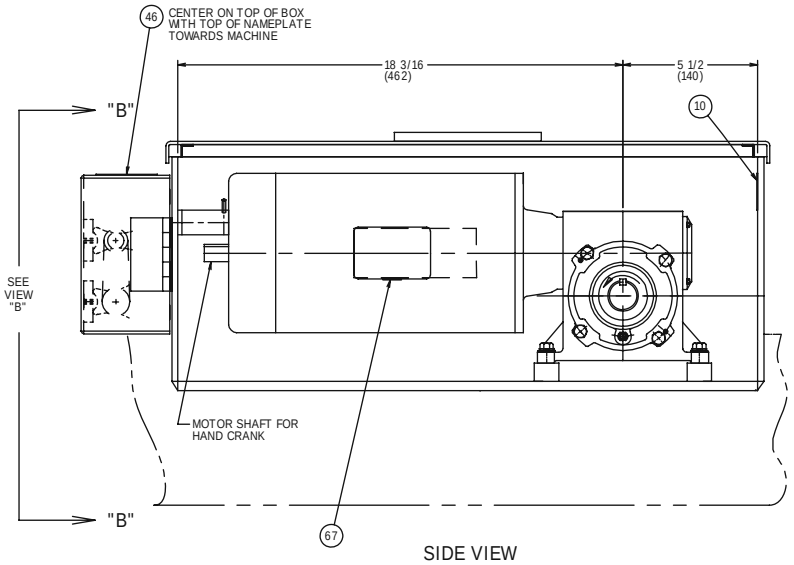
VIEW A
FROM SHEET 1
ENLARGED VIEW LOOKING OUT FROM MOTOR (ITEM 16)
SHOWING ASSEMBLY OF SWITCHES
(ITEMS 11 & 12) TO BRACKETS (ITEMS 8 & 9)



VIEW B
FROM SHEET 1
VIEW LOOKING IN DIRECTION OF ARROWS
SHOWING APPROXIMATE LOCATION OF STENCILS



SECTION C- C
FROM SHEET 1
SHOWING MOUNTING OF TORQUE LIMITER
CLUTCH, CLUTCH DRIVE PLATE &
DRIVING CUP SHAFT



SIDE VIEW
SHOWN WITH SIDE PLATE
REMOVED SHOWING MOTOR (ITEM 16)

Figure 6-4. YM-2000™ Parts Locations for L.H Switch Machine (Sheet 2 of 2)

7. RAIL TEAM AND TECHNICAL SUPPORT

The Rapid Action Information Link Team (RAIL Team) is a group of experienced product and application engineers ready to assist you to resolve any technical issues concerning this product. Contact the RAIL Team in the United States at 1-800-652-7276 or by e-mail at railteam@ansaldo-sts.us.

End of Manual